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THE PARAMETERS OF CONSUMER FOOD DEMAND IN CANADA

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FOREWORD

For a great many years now, development of the Canadian agri-food system has depended heavily on finding markets for our products abroad. With a current annual agricultural trade surplus of over $4 billion, few people would deny the current importance of exports to agriculture and indeed most people expect the prosperity and growth of our industry to hinge crucially on our ability to expand and find new markets overseas for the forseeable future.

While export development is of undeniable importance it is also important to look to the domestic market as a potential source of growth for the agricultural industry. In this connection, it is important to consider what Canadian consumers want to buy at present and how these producers can be expected to change in the future. In the 1980's, it is important not only to consider what effects changes in economic factors such as personal incomes and relative prices may have on the pattern of food demand, but also, are tastes changing now with more emphasis on "fresh" and "lean"? And how will changing demographic factor such as the general aging of the population be expected to affect how much and what types of food products consumer will choose to buy in the future?

This study continues the tradition of consumer food demand analysis at Agriculture Canada by applying contemporary consumer demand analysis techniques to the expanding data base on Canadian consumer food demand. The study provides updated and statistically accurate estimates of the responses of consumers to changing market conditions.

More specifically, the estimates were derived utilizing demand theoretic restrictions via a joint estimation procedure. Estimates of consumers demand responses to characteristics of their demographic and socio-economic profiles are also provided. The results serve as a basic source of parameter estimates to be used in structural and policy analysis, and in forecasting.

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EXECUTIVE SUMMARY

The study analyses consumer food demand at both aggregate and disaggregate commodity levels and provides parameters characterizing Canadian consumer food demand. These parametere are used to calculate price and income elasticities, which are presented in easy to use tables in the appendix.

The study prepares the reader by first providing a theoretical basis for general demand analysis and then states further assumptions that were made specifically for this study. Most previous studies have provided selected information on consumer demand responses to prices, income and demographic and socio-economic characteristics for certain select food types. This demonstrates a need for considering food demand in a systems context and using a flexible functional form that does not make stringent restrictions on the utility function.

Data

The available data on food consumption may be catagorized into two groups, the first being time series data of aggregate consumption and the second, cross sectional data on household level consumption. This study used the latter source and obtained a large data base by pooling information from several surveys. Full budget family expenditure survey data were used for the years 1972, 1974, 1976 and 1978 for food, non-food aggregates and the Urban Family Food Expenditure survey data for 1974, 1976 and 1978 were used to estimate the food disaggregate engel curves and demand systems.

Estimating Procedures

Of the various functions suggested and used by other analysts, the Almost Ideal Demand System (AIDS) was chosen for this study's estimation. The demand equation are non linear in the income

variable, thus allowing the AIDS' to approximate non-linear engel curves (as have been empirically found to be realistic for foods) by assuming prices to be constant for any one survey year.

The estimations were carried out in two phases. In the first phase, the Full Budget survey date were used to estimate (i) Engel functions (ii) Food, non-food demand systems and (iii) food at home, food away from home and non-food demand systems. To investigate the effect of socio-economic and demographic characteristics on the estimated Engel functions and food demand systems, the data were partitioned by Income Strata, by Family Type, by Employment Status, by Educational Attainment of the Head of the Household and by Tenure of the Family Home. In the second phase, the Family Food Expenditure survey data for seven food disaggregates were used to estimate (i) Engel curves, (ii) single demand equations, with and without demographic variables and (iii) systems of demand equations, with and without socio-economic and demograhpic scale.

Results for Food, Non-Food Aggregates

Engel function were estimated using a single demographic scale variable, "family size" and the elasticities of quantity demanded with respect to total expenditure and with respect to family size were calculated. The expenditure elasticities for food at home are positive but less than 1 for all income group while those for food away from ome are greater than one. Elasticities for non-food are more than 1 for all income groups. The family-size elasticity for food at home expenditure is positive and increases with income level. For food away from home and for non-food the family size elasticites for all five income groups are negative.

Elasticities of demand from the demand systems estimates showed that food at home is a price inelastic necessary good i.e. both own price and income elasticities are less than one. Food away from home was also price inelastic but the income elasticity was greater than one. Some estimated cross price effects are suspect.

The estimated own price elasticites of demand were more negative than those estimated from time series date in another study. The estimated parameters, therefore, tend to support the hypothesis that time series estimates capture shorter run effects than do budget data estimates. While the relationships between own price elasticity and income class for food at home and food away are not strictly proportional, there are general tendencies evident. The own price elasticity for the food at home tends to become more negative with increasing income. In contrast, the own-price elasticity for food away from home becomes less negative with increased income, and the non-food own price elasticity shows no pattern over the five income quintiles.

Statistical tests of the hypotheses of demand theory rejected homogeniety. The hypothesis of symmetry was not rejected for the functional form that excluded household size but was for the form including household size.

Results for Food Disaggregates

Total expenditure elastities calculated from the Engel function estimates were positive and less than 1 for all food groups with the meat, poultry and fish group being the most expenditure elastic and the fats and oils group coming next. The estimates of single demand equation resulted in all own price elasticites being negative and less than one in absolute value. Dairy products group however, was the most price elastic and fats and oils the least.

The estimates of system of demand equations gave own price elasticities very close to those obtained from the single demand equations, especially for cereal and bakery products and for meat, poultry and fish. The cross-price elasticities calculated from the systems estimations, however, indicated significant differences compared to the elasticities from single equation estimates. For example, fats and oils is estimated to be a complement for meat, poultry and fish rather than being a substitute as from the single equation estimates. Variations in sign and in magnitude indicate the inaccuracies which can result from not utilizing the extra information available in the data through the use of the systems estimation method.

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I INTRODUCTION

In July 1981, the Minister of Agriculture announced an Agri-Food Strategy for Canada. The Strategy identified long-term goals for development of the Agri-Food sector and outlined policies for their achievement. As one facet of increasing the management of the agri-food sector, the Strategy calls for the re-orientation of the sector to take advantage of domestic market opportunities. As management of the agricultural production and distribution system is increasingly co-ordinated with the consumer sector analysis of various issues will require extensive and detailed information on the economic aspects of the food system and on the nature of the consumer demand for food.

For example, accurate knowledge of the structure of consumer demand will assist analysts in anticipating the changes in consumer demand resulting from changing market conditions. This knowledge can aid producer supply management and marketing agencies to more efficiently match their supply levels with consumer requirements while maintaining a price level which is adequate to provide an equitable return to producers.

Knowledge of domestic food consumption requirements and responses in combination with domestic production forecasts may also be of help to analysts in identifying potentially exportable domestic surpluses and conversely in indicating commodities for which the potential exists to enhance domestic production to displace imports.

In addition to the applications mentioned above, the improved knowledge of domestic food demand provided by the study results will also be of assistance in addressing issues of consumer welfare. A recurrent concern involves the effects of food price inflation on various socio-economic and demographic groups within the population. Detailed knowledge of the food demand characteristics of these socio-economic and demographic groups will assist in analyzing this issue and in designing programs to ameliorate the conditions of those hardest hit. The study results will also be of assistance in assessing the implications for the food system of the increasing proportion of the elderly in the population in coming years.

This study analyses Canadian consumer food demand at both aggregate and disaggregate commodity levels, and provides parameters characterizing Canadian consumer food demand. More specifically, the study examines the allocation of consumer spending between food and non-food expenditures as well as between food at home, food expenditure in restaurants, and non-food expenditure, It investigates how these allocation decisions are affected by socio-economic and demographic factors such as family size and composition, employment status of the household adults, educational attainment of the household head, and tenure of the family home. The estimated system of equations for the food at home, food in restaurants and non-food categories was statistically tested for conformity with the theoretical hypothesis of homogeneity of degree zero in prices and expenditure, and of symmetry of the matrix of expenditure compensated substitution terms.

The study has also estimated complete matrices of own and cross price, and expenditure elasticities for seven foods as single Almost Ideal Demand System (AIDS) equations and as a system of AIDS equations using a seemingly unrelated equations systems estimator. The seven equation system was also estimated using a demographic equivalence scale to examine the effects of socio-economic and demographic characteristics on disaggregate food demand.

This is the first study to derive complete matrices of elasticities for aggregate and disaggregate (food group level) consumer demands for food from the combination of multiple Urban Family Food Expenditure Surveys. It is also the first study to provide a complete matrix of simultaneously estimated own price, cross price and expenditure elasticities for Canadian consumer food demand at disaggregated levels.

The study was carried out using cross-sectional data for the Full budget survey, those being for the years 1972, 1974, 1976 and 1978 and three cross sections of the Food budget survey, namely those for 1974, 1976, and 1978. Prices used were the Consumer Price Indexes for the corresponding years.

II REVIEW OF DEMAND THEORY AND RELATED DEMAND STUDIES

II.1 Demand Theory

II.1.1 Basic Hypotheses

The theory of consumer demand postulates that consumers derive satisfaction or utility through the consumption of goods, and that each consumer attempts to maximize the satisfaction or utility which he or she can attain.

The maximum level of utility attainable is determined by the consumers ability to consume and to purchase goods for consumption from his or her income. The theory postulates that each individual consumer's purchases of any particular good will depend on several factors, the most basic being the individual's preferences. The other factors include the individual's income, and the prices of the particular good and of all other goods which the individual purchases.

Each consumer is hypothesized to simultaneously choose the quantity to purchase of each good subject to his or her income or budget constraint so as to maximize the satisfaction he or she derives from consuming these goods. Therefore if the quantities of particular goods purchased by an individual consumer are observed in a number of situations between which prices and the individual's income vary then it is theoretically possible to derive a complete representation of the individual's preferences. This can then be used to predict the individual's consumption behaviour under differing price and income situations. For example, the analyst may want to predict how the individual's purchase decisions will change when there is an increase in the price of one particular good such as food, or how these decisions will change when an increased tax is imposed on the individual's income.

The theory postulates that certain basic reactions of individuals are constant. The hypothesis of homogeneity of degree zero of quantity demanded in prices and income states that if all prices and the individual's income simultaneously increase (or decrease) by the same percentage, then there will be no change in the quantities of goods purchased by the individual.

The hypothesis of adding-up states that as a result of any change in prices of goods or in the income of the individual, he/she will adjust the quantities purchased of each good so as to result in his/her incremental income being exactly spent.

The hypothesis of symmetry of the matrix of compensated price derivatives states that if an individual's income is compensatingly adjusted to permit a constant level of satisfaction or utility, then the change in the quantity purchased of a particular good A, as a result of an incremental change in the price of another good B, will be of the same magnitude as the change in the quantity purchased of good B due to an incremental change in the price of good A.

A fourth hypothesis of the theory, the hypothesis of negative semi-definiteness of the matrix of compensated price derivatives, implies that when the individual's income is compensatingly adjusted to permit him or her to maintain a constant level of utility, then when the price of a good increases (decreases) the individual will purchase less (more) of that good.1

II.1.2 Multi-level Budgeting

While the basic theory hypothesizes that the consumer considers the prices of all goods in order to decide on the quantity to consume of any particular good, it may be that in practice this decision process is more complex. It is certain that the modelling of the consumption decision in this manner requires the consideration of too many prices to be econometrically feasible when the goods to be considered are highly disaggregated.

To operationalize the theory analysts have introduced various assumptions about the grouping of individual items into aggregated commodities such as food, shelter, clothing, etc. These assumptions are based on the observation that certain goods, for example various types of food, interact closely in yielding utility to consumers. Goods outside of these groups are observed to have little or no effect on the utility derived from goods within the group. For example, the quantity of books purchased has little effect on the utility derived from various foods. In addition, if books are grouped with other entertainments then the relationship between each of the individual types of entertainment and the aggregate, food may be similar.

The assumption that goods are separable into groups with similar relations among all commodities in one group and any commodity in another group allows the analyst to consider the prices of fewer goods or groupings of goods when estimating the consumers decision concerning quantities to purchase.2

The assumption of a specific type of separability, weak separability, allows the analyst to assume that consumers behave as if they followed a decision-tree budgeting process. This implies that consumers first decide how much of their current income to save and how much to spend, and secondly allocate the portion to be spent among several broad expenditure categories eg food, shelter, clothing, recreation, transportation, considering only the aggregate prices of these groups and the total to be spent. The theory does not provide rigid guidance on the number of groups or on their composition and this decision is usually made on an ad hoc basis by the researcher.

The decision tree budgeting assumption further implies that consumers allocate the expenditure on any one of the broad categories, eg food, among the individual items in that category, eg, milk, eggs, butter, on the basis of the prices of the individual items within the group and the total expenditure on that broad category.

The assumption that consumers behave as if they follow this sort of budgeting process allows the analyst to operationalize the theory in that it restricts the number of prices to be considered as the determinants of the quantity consumed of any individual item. In practice, because the division of total spending into groups is somewhat ad hoc, the analyst can define the groups he is interested in considering and thereby choose the number of prices to be considered as determinants of expenditure on any particular good.

II.1.3 Aggregating Over Consumers

One other difficulty in operationalizing the theory relates to the fact that the theory is defined in terms of the individual consumer. In practice, the analyst rarely has observations on the quantity purchased by an individual consumer, of each good of interest, under varying prices and levels of income. More commonly the analyst has observations of total consumption of some aggregate group of consumers, for various goods, for successive periods in time. An example of such "time series" data would be observations of the total Canadian consumption of beef for the years 1949 to 1981. Usually each successive time period, each year in the example, would have one distinct price associated with it. Therefore the observation is for the aggregate of Canadian consumers, rather than for one individual.

Also commonly available are data sets composed of observations of individual households' consumption of various goods during one time period, where obversations are made for a large number of households. The prices faced by the households may all be the same if they are all sampled at the same point of time in the same area, or may vary due to spatial and or temporal price variation. In either case each individual household's quantities purchased are known for only one combination of prices and income.

In order to estimate a preference structure, the analyst requires observations of the purchased quantities under various price and income situations. Therefore it is commonly assumed, for time series data, that each year represents a different price and income situation for a hypothetical consumer, who is defined to be the aggregate of all consumers. For household data, it is commonly assumed that each household observed represents a different observation, under a differing price (if prices vary) and income situation, which is equivalent to assuming there is only one hypothetical household on which numerous observations were made.

Both of these common practices assume that the theory of the individual consumer can be applied to groups of consumers, either the aggregate of all consumers, or the aggregate of the households sampled, and that those groups behave as though they were individual consumers. This assumption has been based on two arguments.

One heuristically states that for large groups of consumers the differences in behavior will tend to average out and in the aggregate consumers will act as though they were a representative individual consumer.[3] The second argument is based on the theoretical result that if all consumers have the same marginal propensity to consume each good then the aggregate of consumers will behave as though it were a representative individual consumer.[4]

The basic implication of this latter assumption is that the distribution of income does not affect market demand. This restricts the effect which income can have on the individual consumer's quantities demanded to being a linear relation.

More recent work on the problem of aggregating over consumers is the development of a method which explicitly takes into account the distribution of income among consumers in aggregating individual consumer's behavior into that of a representative consumer.[5] This result permits the relationship between the quantity demanded by the individual consumer and his or her income level to be non linear, although it assumes that the proportion of total expenditure spent on any commodity is a linear function of income.

The recent work is of particular importance to demand estimations for food commodities as the relationship between the quantity consumed of particular food items and the income level of the consumer has been found to be better approximated by a non linear relationship.[6] This latter finding is referred to as Engel's Law.

II.1.4 Differing Preferences and Demographic Scaling

Another common implicit assumption in work which aggregates across consumers is that the consuming units of each observation behave as though they all have the same preference structure. While it could be reasonably argued that the aggregated preferences of the national population do not change radically over the time frame considered in most time-series analyses, it may not be particularly plausible to assume that different households in a cross-sectional data set, each of which may have a different number of members of differing ages, et cetera, all behave as though they have the same preference structure. For instance a family of two is not likely to make the same consumption choices as a family of six given that both have the same level of income. Neither is it likely that a single parent and child will have the same purchasing habits as a married couple of the same income.

This conjecture is affirmed by empirical demand analysis which has shown that family preferences, as revealed by their purchases, are dependent upon family size,[7] and age of family members.[8,9] This finding implies that family consumption responses to changes in prices and incomes will also be dependent upon family characteristics and indicates the importance of including demographic characteristics as determinantal variables in demand analysis. Several procedures have been developed for including demographic variables in demand analysis, and empirical work has found that a technique referred to as demographic scaling is superior to other techniques when it is desired that the resulting demand system be theoretically plausible and not overly restrictive.[10]

Numerous studies of family consumption responses to income variations, known as Engel function analysis, confirm that consumption responses to changes in income are dependent upon the demographic and socioeconomic characteristics of the family. It has been found that the number of family members[11,13,15,16] as well as their age[11-13,15,16] influence consumption responses. Some studies also find variation in family consumption responses depend upon other family characteristics such as the family members' race,[13,15] and educational attainment,[11-13] the area in which they reside, urban or rural,[12,15] and geographic region of the country,[11,13,15,17] whether the female head of the household is employed outside the home or not,[12-15] and the tenure of the family home.[11,15]

For most types of demand analyses the effects of demographic variables can be adequately isolated by assuming that households make consumption expenditure decisions given their demographic characteristics, or in other words they do not view their demographic characteristics as choice variables. For example, prediction of future consumption expenditures, analysis of the amount of compensation required to maintain households at the same level of welfare after an increase in food prices, and analysis of the benefit to consumers of lower food prices as a result of government programmes to stabilize producer prices can be conducted using this type of demographic scaling.

In contrast certain other types of analyses require that the choice of demographic characteristics be considered as part of the families utility or satisfaction maximizing behavior. For example, analysis that compares welfare levels of one household with different demographic profiles, such as determination of the additional income required to keep a household at the same welfare level when an extra child is added, requires that the choice of whether or not to have the child be considered as part of the family's utility maximizing behavior. For the family the addition of an extra child means a lower per person expenditure level and if the family has a strong preference for children, the lowering of per person expenditure may be largely or completely compensated for by satisfaction derived from the presence of the child. However if the family has a lesser preference for children some additional income will be required to keep the family at the same welfare level as before the addition of the extra child. If the family was completely indifferent to extra children it would require an addition to income in exactly the amount of the extra costs of the child in order to maintain the same level of welfare.

A problem which is yet more difficult is the comparison of the welfare of different families with different numbers of children, for example to determine assistance payment levels. This requires that the demographic variables be considered choice variables, and in addition that interfamily comparisons of satisfaction be made. Technically interfamily comparisons require a mapping which associates with each indifference curve of one family a corresponding indifference curve for the other family such that the corresponding curves represent the same levels of satisfaction.

In the remainder of this study it is assumed that households do not consider their demographic characteristics to be choice variables.

Having briefly reviewed the factors likely to be important determinants of consumers food demand behavior and the general techniques of and problems encountered in demand parameter estimations, we turn and review the empirical work examining consumer food demand patterns in Canada.

II.2 Previous Studies of the Parameters of Canadian Consumer Food Demand

A number of previous studies have investigated Canadian consumer demand for either various types of food or for food as an aggregate. Specifically, research into the consumer demand for types of food includes; a study examining the responsiveness of retail prices of fruit and vegetables over the period 1949 to 1966 to consumers demand,[18] a study estimating consumer demand in 1969 for 8 dairy products as a function of household income and demographic characteristics,[19] a study estimating consumers demand for milk, butter, cheese, and milk powder over the period 1958-1972 using single demand equation and demand system estimation,[20] a study investigating demand for eggs over the period 1961-1973,[21] research estimating consumer egg demand within the context of a production consumption model,[22] a study of the demand for margarine, lard, shortening and butter using data for the years 1950-1972 estimated both by single equation and in a demand system framework,[23] a study estimating a system of demands for beef, veal, mutton and lamb, pork, and chicken over the period 1954-1970,[24] a study estimating domestic consumption of beef, pork, lamb, veal, chicken and turkey over the years 1954-1972 using two demand systems estimators,[25] a study estimating demand for beef, pork, veal, chicken, and turkey using non-linear single demand equation estimating techniques applied to quarterly data from the period 1965-1976,26 and a study of the seasonal variation in demand for beef, pork, veal, chicken, and turkey using quarterly data for 1965-1976 and both single equation and systems estimation methods.27

These studies provide the analyst with selected information on consumer demand responses to prices, income, and demographic and socio-economic characteristics for certain select food types. These studies indicate the desirability of considering food demand in a systems context and indicate some problems with and limitations inherent in the use of typically available time series data.

Research examining the demand for food as an aggregate is of two types. Numerous studies include food as one component of total consumer demand and estimate the demand for food along with the demand for clothing, housing, transportation, etc.28-35 However there are relatively few studies which have examined total food consumption by looking at a complete set of disaggregated food groups. One study uses household consumption data from the 12 months of 1974 and applies single equation estimation methods to examine the responsiveness of household's consumption of each of approximately 100 types of food expenditures to changes in household's income level and to changes in the price of the food type.36 Another study using the same data applies single equation estimating methods to examine consumer demand responses for 24 food categories which include all foods to changes in prices of the food category, to changes in price of a substitute food, to changes in income and to demographic characteristics.37

The studies provide information on the interrelationships among the consumer's demand for various foods and provide an example of the richness of the household budget data base for the examination of consumer food demand response.

The only study (to the authors' knowledge) to estimate a complete set of demand response parameters characterizing the responsiveness of Canadian consumer's demand for a complete set of disaggregated food types utilized time series data for the period 1950-1972. A set of parameters characterizing the responsiveness of consumers food expenditure on each of 27 food classes to changes in income and to changes in the prices of each of the food classes was estimated.38

The results of this study provide a good first approximation to the desired information on domestic food consumption requirements and responses mentioned in Section I, Introduction. However, as a consequence of the methodology used to obtain the estimates they are somewhat less reliable than currently available methodology allows the researcher to obtain.39

Specifically the analysis utilized a double logarithmic estimating equation, the assumption of block additivity, and a somewhat ad hoc procedure for calculating cross price responses in order to overcome problems associated with having only a small number of data points on which to base the estmates.

The assumption of block additivity restricts the estimated parameters and therefore the estimated consumer preference structure in a rather unrealistic fashion. Block additivity implies that the substitution effects between goods in different blocks are all of the same sign, being either complements or substitutes. The change in the consumption of bread, in the cereal and bakery products block, caused by a change in the price of oranges, in the fruit block, is of the same sign as that of the change in the consumption of bread caused by a change in the price of milk, in the dairy block, and of the same sign as that caused by a change in the price of lard, in the fats and oils block.

The assumption of a log-log form for the demand function is generally inconsistent with the description of consumers behavior in the context of utility maximization. Estimates using this functional form are therefore not appropriate for the analysis of welfare issues which requires the assumption of a utility function.

The method used to calculate the cross price responses was somewhat ad hoc and as a result the estimates are dependent upon the order in which the food classes are considered.

While the study results provide a good first approximation, the ready availability of improved methodology and data bases invite the analyst to re-estimate the parameters of Canadian consumer food demand. In response, this study estimates a set of parameters characterizing Canadian consumer demand responses for individual food types to changes in food and non food prices, to changes in income levels and to changes in the socio-economic and demographic structure of the population. In technical terms it is desirable that the estimates be from a model of consumer behavior which is consistent with utility maximizing behavior and which does not make stringent implicit or explicit restrictions on the form of the utility function.

The following section discusses the method used to obtain the set of parameters and Section IV continues with a discussion of the parameters and what they reveal about the structure of Canadian Consumer demand for food.

FOOTNOTES FOR SECTION II

1. For a more complete exposition of the economic theory of consumer demand presented here see Deaton, A. and J. Muellbauer, Economics and Consumer Behavior, Cambridge, Cambridge University Press, 1980 or see Russell, R.R. and M. Wilkinson, Microeconomics, Toronto, John Wiley and Sons, 1981.

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III METHODOLOGY OF THE STUDY

III.1 Data

The methods by which estimates of the structure of Canadian consumer food demand may be obtained are in part constrained by the basic data available on food consumption and food prices. The available data may be categorized into two groups, the first being time series data of aggregate consumer consumption and the second being cross sectional data on household level consumption. Each type of data has advantages and problems when considered in light of the study's objectives. These are elaborated upon below.

III.1.1 Time series data

Time series data on personal income, on total consumer expenditure and on aggregate consumer expenditure on the two categories of food, food purchased from stores and meals purchased in eating establishments are available in the National Accounts. The expenditure data series are provided in both current and constant dollar forms which allows the derivation of implicit price deflators.

To look at consumption of individual food items the National Accounts series may be combined with Statistics Canada series on Apparent Per Capita Disappearance of Food and Consumer Price Indexes. The Apparent Per Capita Disappearance of Food series provide data on annual apparent consumption of more than 140 individual food types. These series began in 1950. Recently the series have been revised back to 1960 and are not completely consistent with the old series extending back to 1950. As a result the longest consistent series currently include 23 observations each. The Consumer Price Indices provide price data on approximately 120 food types and are consistent with low aggregation level of the quantity series.

Time series data on the socio-economic and demographic characteristics of the population can be assembled from several sources. Statistics Canada provides annual estimates of population by age class and sex, and information on the effects of labor force participation on consumption can be examined using the labor force survey data. Information on household composition or family make-up, on the distribution of income and on other social characteristics is only available for census years.

Estimation of consumer demand responses from time series data tend to provide parameters which capture short-run responses in consumption behavior.[1] It has been hypothesized that this finding is a result of the fact that during the one year period of an annual observation some consumers will be adjusting to the prevailing market condition while others will be adjusted to equilibrium and consequently, the observed aggregate is a combination of long-run equilibrium behavior and short-run dis-equilibrium behavior. The parameters estimated from time-series data reflect this combination, and when the parameters are to be used to predict consumer's short-run responses, this is to be desired.

The estimated responses in consumer expenditures for food will represent the aggregate responses of the population to shifts in the explanatory variables. While it is desirable that this be the case when the objective is to make predictions of short-term responses, it may not be accurate information on which to base comparisons of welfare among households. Whether it is or not will depend upon the method used for aggregation of the variables over consumers and specifically upon whether the assumptions implicit in the method used are sufficiently realistic and in keeping with economic theory. Specifically, the time series data on quantity consumed and on socio-economic variables in the above data sets are not aggregated according to the currently accepted theory, i.e. they are simple rather than weighted sums.[2]

It has also been found that there is often a high degree of correlation between aggregate prices and aggregate income over time. This collinearity could result in difficulties in econometrically separating price and income responses. However, for disaggregate commodity groups the degree of correlation is not likely to be as high.

A further limitation of the time series data is on the number of individual food types which may be considered without making strong a priori assumptions about consumers utility function and substitution responses. In general, the number of observations must be larger than the number of food types considered.

III.1.2 Cross-Sectional Data

Cross-sectional data on household level expenditures is collected by the Statistics Canada Urban Family Expenditure Surveys. There are two such surveys. The Full Budget Survey asks each household sampled to recollect its expenditure during the year on each of over 300 budget categories. The Food Budget Survey asks each sampled household to keep a written diary of the quantities of food items purchased, and of the expenditure on each, for a two-week period. The Full Budget Survey has recently been conducted in March of 1972, 1974, 1976, 1978 and 1982. The Food Survey has recently been conducted in two week periods throughout the years 1974, 1976, 1978 and 1982. At the time of writing, data from the 1982 surveys were being processed.

It is possible to derive the average price consumers paid for each type of food in the Food surveys by dividing the expenditure by the quantity purchased. Differences in these prices may reflect differences in the price per standard unit of the good, and/or differences in product quality and in package sizing of the product. As there is no information in the Food Survey on product specifications the study assumes that within food types, all brands of individual items are homogenous. Therefore, price differences are assumed to represent differences in price per standard unit of the commodity.

For the Full budget survey, quantities are not reported and therefore prices cannot be derived. Under the assumption that the goods within any one commodity group are homogenous, price series from the CPI may be used. The CPI series price a homogenous good through time.

In addition, the Consumer Price Index (CPI) are available for other than the survey time periods, thus facilitating application of the results for forecasting. For this reason, it would seem desirable to use the CPI series that correspond to the food categories surveyed in the Food Budget rather than the derived prices from survey data. The CPI series, however, need some adjustment to correspond to individual commodity types in the survey.

The CPI for any given commodity is available by month for each of the major Canadian cities. In each city, the index level is measured relative to a price level set equal to 100 in a base year. In that base year actual price differences between cities are ignored by the CPI. This procedure is undesirable for the purpose of this study in that identical consumers in two cities with different price levels for the same commodity will purchase different baskets of goods. Using the CPI series with indexes in all cities set equal to 100 in the base year will obscure this fact, and will affect measured demand responses.

Therefore the CPI indices for the various cities for any given commodity should be adjusted to reflect the differences between cities in the absolute price level for that commodity. Adjustment factors comparing the actual price levels for different cities were made available by Statistics Canada to make this adjustment for the food survey prices.[3] However, due to the nature of the data base available and the more complex nature of the problem, Statistics Canada was not able to provide indices for the full budget prices, and thus no adjustment was made.

In order to use the surveys to estimate consumer demand responses for disaggregated food commodities to changes in total expenditure requires combining of the estimates from the two surveys, since the food survey does not collect information on household's total expenditures. The reliability of the resulting estimates will be influenced to an extent by the consistency of the two surveys.

Both surveys collect data on the socio-demographic characteristics of households. Households are asked to provide information on the number of members in the household and on the age, sex, occupation and the preceding year's income of each, as well as on the tenure of the family home.

The Surveys also overlap in other areas. The full budget survey collects food expenditure data on five categories.

1. food at home;

2. food purchased away from home while on a trip; and

3. three categories for meals purchased away from home while not on a trip, i.e. breakfast,lunch and dinner.

Comparison of the two surveys results does indicate some discrepancies. The Food survey data collection is ongoing throughout the year, and as each household is asked to report income for the preceding twelve months, the time period which this report covers varies from being the year preceding the survey for households surveyed in early January, to the actual year of the survey for households surveyed in late December. The income figures from the Food survey thus tend to be lower than those from the Full budget survey.[4]

There is also a tendency in the 1974 and 1976 surveys for food at home expenditure as reported in the Full budget survey to exceed that reported in the Food budget survey by a substantial amount.[5] It is possible that consumers may perhaps unintentionally omit certain items when maintaining diary records, and may tend to under-report bulk purchases of storable food items such as freezer meats. In addition consumers may have reported Full budget food expenditures based on average food prices at the time of survey data collection in the early part of the following year. Given that these prices are higher than the average of the year under consideration this could result in upward bias. In addition consumers may not have eliminated all non-food grocery items from their Full budget reports of food expenditure.

The inconsistencies between the two surveys thus appear to be not inconsiderable, but neither so large as to be a major cause of error.

While the use of time series data allows the derivation of parameter estimates which characterize short-run demand responses, the use of purely cross sectional data to estimate demand response parameters tends to result in estimated parameters which characterize responses in the long-run equilibrium of consumers.[6] In the cross-sectional observations of consumers which are taken at one time, all consumers will tend to be in the same relative state of adjustment to equilibrium to factors not considered in the analysis. Therefore, any disequilibrium responses will not typically be captured in the estimates. In using data from cross sectional observations made at different times the effects of adjustment to equilibrium will not be entirely eliminated, as consumers sampled at different times may be in varying stages of adjustment to equilibrium. Thus the estimated parameters will characterize some degree of partial adjustment to the long-run equilibrium. Previously it was thought that time series estimates would more accurately reflect and predict consumers short run behavior. The reason was that the relative degree of adjustment by consumers within any given short run time period, such as a year, is more likely to be captured by estimates from time-series data since that relative degree of adjustment by consumers is inherent in each of the observations.

Recent work indicates that cross sectional estimates which account for demographic and socio-economic variation between households and which aggregate consistently across consumers do accurately characterize consumers time series responses.[7]

Another feature of the cross sectional disaggregate data is that it also includes observations in which the family did not purchase a particular item within the time period of the survey. This may occur as a result of the household never purchasing the item. In this case if a linear estimator is being used the observations of nil purchase should be included in the estimations if the results are to be used to forecast demand levels, however they may be excluded if the results are to be used to predict consumption responses to changes in prices, incomes or socio-demographic variables. As it is difficult to identify which nil purchases are a result of this reason it is not possible to selectively exclude these observations. Therefore, it is more appropriate to use a non linear Tobit type estimator.[8] Non linear estimation with the size of data set utilized would have been costly in terms of computational costs.

Nil levels of purchasing may also be observed if the household is not purchasing and not consuming due to the prevailing prices, given its income level and preferences.

Nil levels of purchasing may also be associated with consumption out of household stocks during the survey period. Clearly for goods which last longer than the survey period this can be the case, and will more probably occur the longer the life of the good, in relation to the survey period. An argument may be made that while some households consume from stocks, other households will purchase more than they will consume during the survey period in order to replenish stocks, and these two effects will tend to offset each other. However, it is probable that stocks will tend to be accumulated when lower prices prevail, e.g. when retailers offer discounts or specials, and that stocks will tend to be drawn down when prices are relatively higher. Therefore to determine consumers expenditure responses, it is appropriate to include nil purchase observations resulting from consumption from stocks and to use an appropriate estimating methodology.[9] This problem is not addressed in the remainder of the study due to computational resource constraints.

The use of household level information on consumption also largely avoids the problems of aggregating across consumers in a consistent manner in order to determine an aggregate utility function and preference structure. If the aggregation over consumers is required it can be done in a manner known to be consistent with individual household's behavior.[10]

III.1.3 Data Evaluation

In brief the use of time-series data produces estimates of consumer responses which are accurate for predicting short-run behavior. The time series information on socio-demographic aspects of the population is not highly detailed. The assumption of homogenous quality products must be made as no information is available on quality differences. There are a relatively small number of time-series observations available and the observations represent an aggregation over all consumers which is theoretically consistent with an undesireably restricted form of the individual household's utility function and preferences (see J. Muelbauer).

In comparison the cross sectional data set provides information on very disaggregated categories of consumer expenditure at the household level and provides fairly detailed socio-demographic information on the household members. The assumption of homogenous quality products must be made in which case CPI price series may be used as prices. The CPI price series must be adjusted to account for relative intercity price differences in the base period of the indices. There are some discrepancies between the Full budget and Food surveys indicating some reporting and/or sampling problems. The surveys also contain observations of nil levels of purchase for certain expenditure categories. This should be dealt with using specialized estimation procedures as was mentioned above (see also Note 7). In addition, estimates from data sets composed of cross sections observed at different periods of time may reflect a certain amount of short-run adjustment phenomena but it is not clear how this should be interpreted. In addition estimates from cross sectional disaggregated data avoid the problems of aggregation over consumers mentioned in connection with time series data.

Although there are advantages and shortcomings with both data sets, it appears that the objectives of this study, are better served by the use of the disaggregated cross sectional household data. The study will therefore utilize the four available cross sections of the Full budget survey , those being for the years 1972, 1974, 1976 and 1978, and the three cross sections of the Food budget survey, namely those for 1974, 1976, and 1978.

III.2 Model

III.2.1 Decision Steps and Food Commodity Categories Modelled

In using the household budget data set, the study assumes consumers follow a three step budgeting process similar to that outlined in Section II.1.2. Consumers are assumed to first decide on the allocation of their income between savings and current consumption. This decision is not considered in the subsequent estimates of this study. In the second step consumers are assumed to allocate total current expenditure among the three categories (i) expenditure on food purchased from stores, (ii) expenditure for meals in eating establishments and (iii) expenditure on non-food commodities. The study models this decision step using the full budget data by estimating the expenditure on each of these three categories to be a function of the prices of each, of total current expenditure and of the socio-economic and demographic characteristics of the household.

The third step consumers are assumed to take in their decision process is the allocation of the expenditure on each of the three groups among the individual commodities of the group. Since the study's interest is with food responses, it models only the allocation of expenditure to individual food commodities.

The food expenditure allocation decision is modelled by estimating the expenditure allocated to seven food categories as a function of the aggregate prices of those seven food categories, the total food at home expenditure, and the demographic characteristics of the household. The seven food categories are: (i) Dairy products including butter, (ii) Cereal and bakery products, (iii) Fats and Oils, (iv) Eggs, (v) Fruits and Vegetables, (vi) Meats, Fish and Poultry and (vii) Other Food Purchased from Stores. The choice of grouping is, as has been mentioned, ad hoc from the theoretical point of view, but is consistent with a common sense classification based on similarity of commodities from the consumers' point of view.

III.2.2 Estimating Model

To model the three budget allocation decisions an explicit form of the relationship between quanitity consumed and the determinantal variables considered (prices, expenditure, and demographic and socio-economic characteristics) is postulated and is concisely described as a mathematical function.

Many mathematical functions for demand relationships have been suggested and utilized by other analysts.11 After consideration of these various functions, the Almost Ideal Demand System (AIDS) was chosen for the study estimation.12

The AIDS function offers the analyst several advantages. It provides an accurate first degree polynomial approximation to the true demand relationship implicit in the data, whether or not that demand relationship is consistent with utility maximization, as demand theory states it should be. If the implied true demand function is consistent with utility maximization, the AIDS provides an accurate second degree polynomial approximation to the utility function. As the AIDS is capable of accurately approximating any demand relationship, it can accurately capture the non linearity generally found in the relationship between expenditure on food and total expenditure or income.

In addition the AIDS also can satisfy the hypotheses of demand theory and can be used to test these hypotheses. The parameters of the estimating equations may be restricted in order to ensure that the estimates satisfy the hypotheses of adding up, of homogeneity and of symmetry. The AIDS also allows the aggregation of individual consumers demands in a manner which permits the individuals to have quantities consumed be non-linear functions of income.13 This implies that the aggregate demand functions are dependent upon the distribution of income among consumers. While the aggregation capability of the AIDS is not directly utilized in the study estimations, because household level data is employed, it is implicitly used in the aggregation of the individual members of each household. Finally the AIDS offers the advantage of being a function of which the parameters are relatively easy to estimate.

Due to the large number of observations to be employed in the estimation, the number of equations to be estimated to characterize disaggregated food demand, and due to constraints on computational resources, the employment of a demand equation form which does not require estimation by iterating techniques is highly desireable. Under certain circumstances the AIDS may be estimated by non-iterating methods.

The AIDS was developed from the specification of a class of preferences which permit the representation of the behavior of the aggregate of consumers as though it were the outcome of rational decisions by a representative consumer. The AIDS is derived from the cost function (1), which represents consumers total expenditure as depending on prices and the utility level attained by the consumer. The AIDS cost function is:

$$(1)\quad \log C(u,p) = (1-u)\log\{a(p)\} + u\log\{b(p)\}$$

where C = total current cost or current expenditure
u = utility
p^i = a vector of prices
log a(p), log b(p) are functions discussed below

The cost function can be seen to combine two elements. When utility is nil, or the consumer is at a minimum subsistence level, total cost is a function entirely of log a(p). As u increases the total costs becomes a weighted average of the cost associated with obtaining the subsistence or nil utility level, and of the cost of attaining additional utility at a cost determined by the price index log b(p).

The functions log a(p) and log b(p) are chosen so as to satisfy the theoretical hypothesis of linear homogeneity of prices in the cost function and also so as to provide enough parameters so that the cost function derivatives can, for any point, be set equal to those of any true cost function implied by the data. The forms utilized by the AIDS are:

$$(2)\quad \log a(p) = a_0 + \sum_k a_k \log p_k + \tfrac{1}{2}\sum_k\sum_j A^*_{kj} \log p_k \log p_j$$

$$(3)\quad \log b(p) = B_o \prod_k p_k^{B_k} + \log\left\{a(p)\right\}$$

where a_0 = an intercept or mean parameter
p_i = prices
a_k, A^*_{kj}, B_o, B_k = price parameters

The function (2) represents an index of the total expenditure required for a subsistence or nil utility level existence. The choice of a form quadratic in the logarithms of prices for log a(p) allows the AIDS to accurately approximate the relationship between the subsistence or base level of utility and consumption of goods by a function which is not necessarily symmetric in the substition of one good for another while maintaining utility constant. A utility function of this type is technically refered to as representing non-homothetic preferences.

Function (3) represents an index of affluence, or the price of the purchase of additional utility. The geometric form of the index implies that for any level of utility above the subsistence level, the incremental percentage substitution of one good for another is unaffected by variations in the utility level, or equivalently by variations in the income or total expenditure level.

The fact that (3) is quadratic in the logarithms of prices allows the demand functions to provide a first degree polynomial approximation to any arbitrary demand relationship implied by the data. The demand functions in expenditure share form are obtained as the derivative of log C(u,p) with respect to the log p_i's.[14] These are:

$$(4)\quad w_i(p,u) = a_i + \sum_j A_{ij} \log p_j + B_i u B_o \prod_k p_k^{B_k}$$

or

$$(5)\quad w_i(p,X) = a_i + \sum_j A_{ij} \log p_j + B_i(\log X - \log a(p))$$

where $A_{ij} = ½(A^*_{kj} + A_{jk}{}^*)$
w_i = share of total expenditure allocated to category k
$w(p,u)$ = constant utility, or income compensated share
$w(p,x)$ = constant income, or utility varying share
X = total current expenditure

The AIDS satisfies the hypothesis of adding up if the sum over all categories k of the parameters A^*_{kj} is zero. If the sum over all prices j of the parameters A^*_{kj} is zero the AIDS is consistent with the hypothesis of homogeneity of degree zero in prices and income. The AIDS satisfies the hypothesis of symmetry if the parameters A^*_{kj} with indexes k,j are identical to the parameters A^*_{jk} with indexes j,k. These hypotheses can be imposed through linear restrictions on the estimating parameters, or may be statistically tested for validity against the data. The hypothesis of negative semi-definiteness of the matrix of compensated substitution terms cannot be easily imposed in estimation, and cannot be easily statistically tested in the AIDS, however it can be checked by calculating the eigenvalues of the estimated matrix of compensated substitution terms, (denoted S_{ij}). For the AIDS it is easier to calculate the eigenvalues of $Z_{kj} = p_i p_j\, S_{ij}/X$, the eigenvalues of which are of the same sign as those of s_{ij}. The eigenvalues Z_{kj} are given by:

$$(6)\quad Z_{kj} = A_{kj} + B_k{}^*B_j(\log X - \log a(p)) - w_k^{\delta}{}_{kj} + w_k w_j$$

where A_{kj} = estimated price parameters
B_k, B_j = estimated expenditure parameters
X = total expenditure
w_k, w_j = share of X allocated to k,j
δ_{kj} = Kronecker delta

As was noted in section II.1.4, empirical work indicates that the preferred method of including demographic variables into the demand equations is through demographic scaling. This procedure involves replacing each market price which appears in the demand equation by a scaled price. Under the hypothesis of homogeneity of degree zero in prices and income of the demand function the AIDS share form demands are of the form:[15]

$$(7)\quad w_i(p,X,m) = a_i + \sum_j A_{ij} \log p_j + B_i(\log X - \log a(p) - \log (m^k))$$

where: m^k is the demographic scale reflecting the number of "equivalent adults" in the household
: other symbols are as previously defined

It is evident that the demand quantity form of this equation is non-linear in the income or expenditure variable X thus allowing the AIDS to approximate non-linear Engel curves[16] as have been empirically found to be realistic for food.

The various elasticities of demand, are easily derived from the share form equations (7). The elasticity of demand with respect to income or total expenditure, e_{ix}, are given by:

$$(8)\quad e_{ix} = 1 + \frac{B_i}{w_i}$$

For goods for which B_i is greater (less) than 0, the total expenditure elasticity is greater (less) than 1.

The elasticities of demand with respect to prices, e_{ij}, are given by:

$$(9)\quad e_{ij} = \frac{1}{w_i} (A_{ij} - B_i(a_j + \sum_j A_{ij} \log p_j)) - I_{ij}$$

where $I_{ij} = 1$ if $i = j$
$= 0$ if $i \neq j$

The A_{ik} parameters represent one hundred times the effect on the expenditure share w_i of a one percent change in the price, p_j. Pairs of goods may be described according to the change in consumption of one brought about by a change in the price of the other, either as substitutes or complements. There are various definitions of these terms. In general, if an increase in the price of good j causes a decline in consumption of good i, then j and i are referred to as complements. Conversely, if an increase in the price of good j causes an increase in the consumption of food i, then j and i are referred to as substitutes. The parameters A_{ij} are generally negative for complements and positive for substitutes. We refer to these relationships as "uncompensated" complements or substitutes to differentiate from income compensated (or Hicks-Allen) complements or substitutes.

The parameters A_{ii} characterize the responsiveness of consumption of a good to changes in its own price. When the percentage change in the quantity consumed of a good, caused by a change in the price of the good, is less than the percentage change in the price, the good is said to be price inelastic. The parameters Aii are generally positive for price inelastic goods. Conversely, if the percentage change in quantity consumed is greater than the percentage change in price the good is said to be price elastic and its Aii parameter will generally be negative.

From equation (7) the elasticities of demand with respect to changes in the demographic profile, e_{im}, are given by:

$$(10) \quad e_{im} = \frac{-m^k\ Bi}{w_i}$$

III.3 Estimating Procedure

Examination of equation (7) reveals that the AIDS is non-linear in the parameters a_i and A_{ij} which appear in the index log a(p). Estimation of this form would require the employment of a non-linear estimation procedure. An alternative technique which has been found empirically successful is to approximate the index log a(p) by another type of price index which has fixed parameters.[17] The estimating equations (7) then become linear and may be estimated using ordinary least squares or generalized linear least squares estimation techniques.

Under this assumption, the estimating equations (7) become:

$$(7a) \quad w_i(p,X,m) = a_i + \sum_j A_{ij} \log p_j + B_i (\log X - \log P - \log mk)$$

where log P is the approximation of log a(p)

The price elasticities, equation (9), become:

$$(9a) \quad e_{ij} = \frac{1}{w_i} \left\{ A_{ij} - B_i(E_{p_{pj}}) \right\} - I_{ij}$$

where: E_{ppj} is the elasticity of the approximation index log P with respect to a change in the price p_j

: other symbols are as previously defined

It is noteworthy that the choice of the approximating index log P will affect the form of the price elasticities.[18]

If there is no price variation within the data under examination, the estimating share equations (7) collapse to become Engel functions. The practice in some research has been to estimate Engel functions from expenditure data assuming the absence of price variability. The fact that no data are collected on price variability or the assumption that price variation will be ignored does not affect the fact that price variability is present in the markets from which data are collected. Therefore the Engel function estimates are biased to the degree that the price variability is correlated with the total expenditure or income variability. The estimation of Engel functions for comparison with parameters estimated from full demand equations will provide some indication of the magnitude of this bias and this indication may be used to provide guidance on the required degree of sophistication of future food demand parameters research at Agriculture Canada.

For the full budget data set all observations for which expenditure on total food was nil were excluded. These observations were few in number as few households purchase no food over the length of a year. These few households would be either dependent on others for gifts of food, or would be self-sufficient in food production. In either case the value of the consumed food ought be included in total expenditure and in expenditure on food. As it was not possible to estimate this value the observations were excluded.

In examining the Food budget data set observations for which the household expenditure on total food for home consumption over the period of observation was equal to zero were excluded. A preferred approach to follow would have been to have retained these observations while utilizing a Tobit estimator. The Tobit procedure would account for the zero purchases and would allow the calculation of elasticities conditional on those households already in the market and the calculation of elasticities conditional on those households not in the market.18

In order to provide Engel function parameters for Canada to be used for policy analysis, the study provides estimates of the Engel functions for food at home, food away from home, total food and non-food expenditure. These estimates also provide a link with previous Agriculture Canada studies. To reduce the price variability in the data these Engel functions were estimated for each of the Full budget survey years separately. Price variation between cities remains and may introduce omitted variable bias into the coefficient estimated if the explanatory variables are not statistically independent and will bias upward the estimated variances. Engel functions were also estimated for various one way partitions of the 1978 data in order to investigate the effects of socio-economic and demographic characteristics on the estimated Engel parameters. The data were partitioned by Income Strata, by Family Type, by Employment Status, by Educational Attainment of the Head of the Household, and by Tenure of the Family Home.

The choice of these particular socio-economic and demographic groupings was suggested by the data set. Other characteristics such as population density, race or ethnic origin, seasonality, or geographic region might also be thought of as important determinants of demand behavior. Unfortunately information on race or ethnic origin was not available in either data set. No data on seasonality was available for the Full budget data set.

All data observations were of urban households and thus the effect of relative population density was judged a priori not to be of sufficient interest to policy makers to warrant the increased cost of its estimation. Similarly geographic region was not considered as, geographically differentiated estimates of Canadian food demand parameters have not been of significant interest to Canadian food policy makers in the past.

To examine the variation of the demand parameters due to income levels the household observations within the data set were arranged in order of ascending average income per family member. The households were then divided into five equal groups which resulted in the first group being those households with the lowest average income per family member, etc.

To examine the demand parameters for various family types the household observations within the data set were sorted into one of seven categories. These were: (i) unattached individuals aged less than 65 years; (ii) single adults with children aged less than 16 years; (iii) married couples with the head of the household aged less than 65 years and with no children aged less than 16 years; (iv) married couples with the head of the household aged less than 65 years and with children aged less than 16 years; (v) married couples with the head of the household aged 65 years and over; (vi) unattached individuals aged 65 years and over; and (vii) all other family types.

The demand parameters for households with various male and female head of the household employment statuses were examined. The households were sorted into the following seven categories: (i) male head employed full time and female head employed full time; (ii) male head employed full time and female head employed part time; (iii) male head employed full time and female head not employed or no female head; (iv) male head employed part time and female head employed full time; (v) male head not employed or no male head and female head employed part time; (vi) male head employed part time and female head employed part time; (vii) male head not employed or no male head and female head not employed or no female head.

To examine the parameters of demand for households with various educational levels the households within the data were sorted into groups based on highest level of education attained by the head of the household. The educational attainment groups were: (i) less than

Grade 9; (ii) partial completion of secondary school; (iii) completion of secondary school; (iv) partial or full completion of non university post secondary training programme; (v) partial completion of university; (vi) completion of first degree university programme.

The variation of demand parameters among households with different household tenure types was examined for households which: (i) owned their home and did not have a mortgage; (ii) owned their home and did have a mortgage; (iii) were renting or leasing tenants of their home; (iv) held their home under any other tenure type.

If the estimation of Engel functions is considered the first step, the second step in the estimation procedure was to model the allocation of total current expenditure. The allocation of current expenditure between food expenditures and non-food expenditures was modelled using a two equation demand system estimated using the combined data of the four full budget surveys and using an iterative seemingly unrelated regressions estimator, with no correction for potential inequality of data variances between surveys. The hypotheses of homogeneity of degree zero in prices and income, and of symmetry were imposed. The estimates may be of use to policy analysts concerned with total food expenditure.

Similarly the allocation of total current expenditure was modelled using a three equation system, considering expenditures on food purchased from stores, on food purchased in eating places, and on non-food items using an iterative seemingly unrelated regressions estimator, with no correction for potential inequality of data variance between surveys. The hypotheses of homogeneity of degree zero in prices and income and the hypothesis of symmetry were again imposed and were also statistically tested for the three category system. These estimates may be used to throw light on questions of policy with respect to food at home or food consumed away from home individually.

Both systems were then estimated from partitioned subgroups of the data to investigate the effects of socio-economic and demographic characteristics on consumer demand.

The remainder of the estimation procedure focussed on the allocation of food expenditure among the individual food categories. To provide Engel function parameters the third step in the estimation was to estimate Engel functions for the seven category disaggregation of food detailed in Section III.2.1. The object of this step is as for the full budget Engel estimates. To reduce price variation and reduce the potential for bias in the estimates the data were partitioned by year. There remained temporal price variability among the months within each year, and interspatial price variability between cities. The estimates were made for an Engel function which included only an intercept term and a total food expenditure term.

The fourth step in the estimation procedure was to estimate single-equation demand functions for the seven category disaggregation. These equations were estimated using linear estimation techniques. In these estimations the hypothesis of homogeneity in prices and income was imposed. This step was carried out to examine the emperical magnitude of the effects of utilizing a single equation estimator versus a seemingly unrelated equations system estimator.

The fifth step in the estimation procedure was to estimate seven category systems of demand equations using a generalized linear least squares estimating technique, which is statistically more efficient that single equation estimation. The seven category system was estimated both excluding and including a demographic scale in order to examine the effect of demographic variables on the demand parameters.

No correction was made for the potential problem of unequal variances of the variables in different years of the survey data. The seven category system was estimated with the hypotheses of homogeneity of degree zero in prices and income and of symmetry imposed.

The results of the various estimates are presented and discussed in the following section.

FOOTNOTES FOR SECTION III

1. Kuh, E. "The Validity of Cross Sectionally Estimated Behavior Equations in Time Series Applications", Econometrica, 27 (1957), p 210-211.

2. See Muellbauer, J., "Aggregation, Income Distribution and Consumer Demand", Review of Economic Studies, October 1975, P. 525-43.

3. Intercity indexes of Retail Price Differentials, Table 12, of Prices and Price Indexes, Catalogue No. 62-002, provides intercity indexes for the following seven food groupings: Dairy Products; Cereal and Bakery Products; Fats and Oils; Meat, Poultry and Fish; Fruits and Vegetables; Eggs; and Miscellaneous Groceries.

4. For example in 1976 the Food survey income estimate averaged 9.7% lower than that of the Full budget survey. See "Reconciliation of Income Information from the Food Expenditure Survey in 1976 and the Survey of Family Expenditure in 1976", Statistics Canada Technical Note, Consumer Income and Expenditure Division, Statistics Canada.

5. See Statistics Canada Technical Note, op. cit. in Note 3.

6. Kuh, E., op. cit. in Note 1.

7. See Jorgenson, D.W., L.J. Lau and T.M. Stoker, "The Transcendental Logarithemic Model of Aggregate Consumer Behavior" in Advances in Econometrics, vol. 1 1982, JAI Press, p. 97-238.

8. See Tobin, J. "Estimation of Relationships for Limited Dependent Variables", Econometrica, Jan. 1958, p. 24-36.

9. Recent papers which deal with the estimation of consumers demand in the situation where the data includes numerous observations of zero expenditure include Ryan, D.L., T.J. Wales and A.D. Woodland, "Engel Curves for Meat Consumption in Australia", Australian Economic Papers, Vol. 21, No. 38, 1982, p. 106-122, and Wales, T.J. and A.D. Woodland, "Estimation of Consumer Demand Systems With Binding Non-Negativity Constraints", Journal of Econometrics, Vol. 21, 1983, p. 263-285. Another paper, Greene, W.H., "Estimation of Limited Dependent Variable Models by Ordinary Least Squares and the Method of Moments", Journal of Econometrics, Vol. 21, 1983, p.-195-212 indicates that limited dependent variable model estimates may be derived from non-iteratively corrected OLS estimates and these estimates will be only slightly less efficient than maximum likelihood estimates.

10. Jorgenson et al., op. cit. in Note 6.

11. Readers interested in the some of the commonly used forms may want to consult the following references. On the Indirect AddiLog Model see Houthakker, H. "Additive Preferences", Econometrica, Vol. 28, 1960; on the Rotterdam Demand System see Thiel, H. "The Information Approach to Demand Analysis", Econometrica, Vol. 33, 1965; on the Linear Expenditure System see Stone J.R.N., The Measurement of Consumers Expenditure and Behavior in the U.K. 1920-1938, Vol. 1, Cambridge University Pres, 1953; on the AIDS see Deaton, A. and J. Muellbauer, "An Almost Ideal Demand System", American Economic Review, Vol. 70 No. 3 p. 312-326; on the Translogarithmic Demand System see Christensen, L.R., D.W. Jorgenson and L.J. Lau "Transcendental Logarithmic Utility Functions", American Economic Review, June 1975, 65 p. 367-83; on the Quadratic Expenditure System see Pollack, R.A. and T.J. Wales" Estimation of Complete Demand Systems from Household Budget Data: The Linear and Quadratic Expenditure Systems, "American Economic Review 68 (1978) p. 348-359.

12. Deaton, A. and J. Muellbauer, "An Almost Ideal Demand System" *American Economic Review*, Vol. 70, No. 3, p. 312-326. The following sections rely extensively on this paper.

13. Also permitted are non-homothetic preferences, although the restrictive assumption that preferences are identical for all consumers is maintained.

14. The derivation follows:

(a) $\log X = (1-u) \log\{a(p)\} + u \log\{b(p)\}$

Note $\log C = \log X$
Substitute Equation (2) and Equation (3) from pages 33 & 34 into (a).

(b) $$\log X = (a_0 + \sum_k a_k \log p_k + \tfrac{1}{2} \sum_k\sum_j A^*_{kj} \log p_k \log p_j) + u(B_o \prod_k p_k^{B_k})$$

Take the derivative of (b) with respect to $\log P_i$.

(c) $$\frac{\partial \log X}{\partial \log p_i} = w_i(p,u) = a_i + \sum_j A_{ij} \log p_j + B_i u . B_o \prod_k p_k^{B_k}$$

Invert (b) to get (d).

(d) $$u . B_o \prod_k p_k^{B_k} = \log X - (a_0 + \sum_k a_k \log p_k + \tfrac{1}{2} \sum_k\sum_j A^*_{kj} \log p_k \log p_j)$$

Substitute (d) into (c) to eliminate the unobservable level of utility u.

(e) $$w_i(p,X) = a_i + \sum_j A_{ij} \log p_j + B_i(\log X - \log a(p))$$

15. Ray, R. "The Testing and Estimation of Complete Demand Systems on Household Budget Surveys", European Economic Review, Vol. 17, No. 3, March 1982, p. 349-369, uses a scaled AIDS model.

The unscaled AIDS share form demand is:

(a) $w_i(X,p) = a_i + \sum_j A_{ij} \log p_j + B_i (\log X - a_0 - \sum_i a_i \log p_j$
$- \frac{1}{2} \sum_i \sum_j A_{ij} \log p_i \log p_j)$

The scaled AIDS becomes:

(b) $w_i(X,p,m) = a_i + \sum_j A_{ij} \log \{p_j(mk)\} + B_i\Big[\log X - a_0 - \sum_i a_i$
$\log\{p_i(mk)\} - \frac{1}{2} \sum_i \sum_j A_{ij} \log\{p_i(mk)\} \log \{p_j(mk)\}\Big]$

The homogenous of degree zero in prices and income scaled AIDS becomes:

(c) $w_i(X,p,m) = a_i + \sum_j A_{ij} \log p_j + B_i\Big[\log X - a_o - \sum_i a_i \log p_i$
$- \log (mk) - \frac{1}{2} \sum_i \sum_j A_{ij} \log p_i \log p_j\Big]$

as a result of $\sum_i A_{ij} = 0$ and $\sum_j A_{ij} = 0$, and $\sum_i a_i = 1$.

16. Engel curves are graphic illustrations or their mathematical formulations showing a relationship between income and expenditure on commodity. Engel (1857) pioneered work in this area.

17. Deaton and Muellbauer, op. cit., propose and use this technique. They utilize an expenditure share weighted index of prices of the form:

(a) $\log P = \sum_k w_k \log p_k$

and compare the results to those obtained using log a(p). For the time series data on British consumption which they employ the approximation is very good. Ray, R., "Analysis of a Time Series of Household Expenditure Surveys for India", Review of Economics and Statistics, Vol. 62, November 1980, reports similar experience using the same approximation applied to a time-series of household budget studies. Blanciaforti, L. and R. Green, "A Comparison of Additive With Non Additive Demand Systems", unpublished paper, Dept. of Agricultural Economics, University of California, Davis, 1981, also reports success using the same approximation applied to U.S. consumption data.

It should be noted that when this method is used the parameter 'a' is not included in the approximating index log P and therefore is estimated as part of the parameter a_i, which becomes $a_i^* = (a_i + B_i a0)$. Explicit account of this may need to be taken in calculating the elasticities of demand. See note 15.

18. In the estimation two types of approximation of log P were utilized. In estimating the allocation of total current expenditure among the categories, food at home, food purchased in restaurants, and non food expenditure, the Consumer Price Index (CPI) for all items was used to approximate log P. The CPI is a Laspeyres index of the form:

$$P1 = \frac{\sum_i p_i^1 q_i^0}{\sum_i p_i^0 q_i^0}$$

where: p = price
: q = quantity
: subscripts identify commodities
: superscripts identify time periods.

Use of this index results in price elasticities of the form 9(a):

$$(9a)\quad eij = \frac{1}{w_i}\left(Aij - Bi.\frac{pj^1.qj^0}{P_1\, X}\right) - Iij$$

In estimating the disaggregated food demand equations the approximation to log a(p) was chosen to be a Fisher price index (Fisher, I., The Making of Index Numbers, Houghton Mifflin, Boston, Mass., 1922) which has the following form:

$$(9b)\quad \log P1 = \tfrac{1}{2} \sum_{i=1}^{N} (w_i^1 + w_i^0) * \log (p_i^1 / p_i^0)$$

This index has been shown (Diewert, W.E., "Exact and Superlative Index Numbers", Journal of Econometrics, Vol. 4, 1976, p. 115-145) to be an exact index for the translogarithmic type of cost or expenditure function of which log a(p) is an example. The use of (9b) to approximate log a(p) in the estimating share equations (7) results in the price elasticities of demand taking the form (9c):

$$\text{(9c)} \quad e_{ij} = \frac{\frac{1}{w_i}\left[A_{ij} - B_i\left\{\tfrac{1}{2}\log\left(\frac{p_j{}^1}{pj^0}\right)(w_j^1 - w_j^1 w_j^1) + w_j^1 + w_j^0 - \sum_k \log\left(\frac{p_k{}^1}{pk^0}\right) w_k^1 w_j^1\right\}\right]}{1 + \log\left(\frac{p_j^1}{p_j{}^0}\right)\left(\frac{w_j^1}{q_j^1} - \frac{w_j^1\, w_j^1}{q_j^1}\right)}$$

where: all symbols are as previously defined.

An alternative to the above method of deriving the elasticities of demand from the estimating equations so they explicitly account for the approximation of log a(p) is to adjust the estimated parameters $a_j{}^{**}$ to account for the fact that as a result of using the approximation log P, the parameters a_j^* equal $(a_j + B_i\ a_\emptyset)$. The value of $a_\emptyset$ represents the log of the expenditure necessary to attain a subsistence or base standard of living in the year in which prices are unity. It was estimated as 7.92787 for prices equal to unity in 1971 for the full budget surveys and the price elasticities of demand for the allocation of total expenditure between food at home, food in restaurants and non food expenditure were calculated using formula (9) after calculating $a_j = a_j^* - B_i\ a_\emptyset$.

It was found that the price elasticities calculated in this manner closely approximated those calculated using formula (9b).

IV ESTIMATION RESULTS

IV.1 Allocation of Total Current Expenditure

IV.1.1 Descriptive Analysis of the Data

Data were obtained from Statistics Canada Surveys of Family Expenditure for 1972, 1974, 1976 and 1978. See sources for Table 1 as to details on surveys. Analysis was restricted to households (strictly 'spending units') located in the 8 cities common to all four surveys (St. Johns, Halifax, Montreal, Ottawa, Toronto, Winnipeg, Edmonton and Vancouver). Records which reported board paid to private households, income from roomers and boarders, or for which expenditure on food was zero were excluded. These restrictions reduced the total usable sample for the 4 surveys combined from 15,174 to 14,402. Analysis is based on special tabulations produced by Statistics Canada, using unweighted data. Total expenditure is here defined to exclude personal taxes, security, gifts and contributions. It is thus the same as total current consumption expenditure as used by Statistics Canada.

The average household total expenditure1 level for the data from the 1972, 1974, 1976 and 1978 full budget surveys which was used in the estimations was $11,359. As Table 1 indicates the average total expenditure per household varied considerably between various groups within the data. When the data are partitioned into income classes based on average income per family member, average total expenditure varied from $7,277 per year for the twenty percent of households with the lowest incomes, to $14,489 for the twenty percent with the highest incomes.

Among the family types considered, the lowest total expenditure level of $3,845 per year was found for unattached individuals aged 65 years and over, among which a large proportion are lower income retired people. The highest average annual total expenditure of $13,841 was found for married couples, with children aged less than 16 years.

TABLE 1. ESTIMATING DATA: SELECTED MEANS OF 1972, 1974, 1976, AND 1978 FULL BUDGET SURVEYS[a]

	Average Household Total Expenditure	Share of Total Expenditure Allocated to			
		Food at Home	Food Away	Total Food	Non Food
All households	$11,359	.178	.0439	.222	.778
Income Strata[b]					
Quintile 1	7,277	.264	.0244	.288	.712
2	10,762	.207	.0338	.241	.759
3	12,464	.178	.0415	.219	.781
4	12,935	.154	.0500	.204	.796
5	14,489	.119	.0619	.181	.819
Family Types					
Married couple under 65	13,019	.156	.0509	.207	.793
Married couple with children	13,841	.190	.0369	.227	.773
Married couple over 65	7,483	.227	.0307	.257	.743
Unattached individual under 65	7,269	.125	.0709	.196	.804
Unattached individual over 65	3,845	.265	.0250	.290	.710
Single adult with children	7,274	.221	.0271	.242	.752
All other	12,399	.179	.0467	.226	.774
Employment Status					
Male head full time; female head full time	14,751	.149	.0535	.202	.798
Male head full time; female head part time	14,272	.169	.0428	.211	.789
Male head full time; female head not employed	12,988	.192	.0388	.230	.770
Male head part time; female head full time	13,936	.163	.0485	.212	.788
Male head not employed; female head full time	10,620	.194	.0324	.226	.774
Male head part time; female head part time	11,386	.170	.0423	.212	.787
Male head not employed: female head not employed	6,546	.245	.0265	.272	.728
Educational Attainment Classes					
Less than Grade 9	8,660	.233	.0338	.267	.733
Partial secondary	10,573	.192	.0417	.234	.766
Complete secondary	11,962	.168	.0447	.213	.787
Non university post secondary	12,279	.161	.0467	.198	.802
Partial university	13,279	.148	.0504	.198	.802
University degree	14,907	.138	.0517	.190	.810
Tenure Types					
Home owned without mortgage	10,251	.208	.0385	.247	.753
Home owned with mortgage	15,131	.171	.0405	.212	.788
Tenant	9,483	.173	.0494	.222	.778
Other tenure	10,681	.161	.0479	.209	.791

[a] Based on unweighted data from 8 cities common to all surveys

[b] Quintiling based on average income per family

Sources: Statistics Canada, *Urban Family Expenditure*, Catalogue No. 62-541, March 1975 (1972 survey);
Statistics Canada, *Urban Family Expenditure*, 1974, Catalogue No. 62-544, Ottawa, 1977 (1974 survey);
Statistics Canada, *Urban Family Expenditure*, Catalogue No. 62-547, Ottawa, 1979 (1976 survey);
Statistics Canada, *Family Expenditure in Canada 1978*, mimeographed tables, Ottawa, September 1980 (1978 survey).

Expenditure levels varied according to the employment status of the household's members from a low of $6,546 per year when both the male and female heads of the household were not employed, to a high of $14,751 per year when both were employed full time.

Household annual expenditures are seen to be positively correlated with the educational attainment of the head of the household, ranging from $8,660 for those with less than grade 9 completion to $14,907 for those with university degrees. The level of average annual expenditures is also seen to vary with the tenure of the household dwelling. On average tenants expenditure per year was found to be $9,483, while that for homeowners with no mortgage was $10,251 and that for homeowners with mortgages was $15,131. These figures may reflect the fact that the building of equity in a home is a form of savings for many individuals; and that those households not making mortgage payments may have other forms of savings, which the survey's data do not reveal.

The shares of total annual expenditure allocated to food at home, food purchased in restaurants, to their sum (total food), and to non food purchases by the households in the data used for estimation is reported in Table 1. The averages for all households in the data show 17.8% of total expenditure going to purchase food for home use, 4.4% for purchase of restaurant food and 77.8% of the total being spent on non food items.

Among the income strata the percentage of total expenditure spent for food at home ranged from 26.4% for the lowest income quintile to 11.9% for the highest income group. The lowest income quintile spent the lowest percentage of total expenditure on restaurant meals, 2.4%, while the upper income quintile allocated 6.2% to restaurant food. Summing the percentage for food at home and food away shows that the lowest income quintile of households spent 28.8% of their total budgets on food while the highest income quintile used only 18.1% of their total expenditures for food. As a result non food expenditures ranged from 71.2% of the budget for the low income group to 81.9% for the high income households.

The data for the family type groupings confirm several expectations. Comparing households composed of married couples with no children and those composed of married couples with children shows that the latter allocate more of their budget to food at home and less to food away. The latter also allocate more to total food. The effect of the presence of children in the family can also be seen by comparing the averages for single parents with that for unattached individuals aged less than 65 years.

Examination of the data averages for households with varying employment status shows that the proportion of the budget for food at home declines and the proportion for food away increases with increasing participation of the household in the labor market. Not surprisingly the total food proportion declines with increased employment of the household heads.

The distribution of the households, within each income quintile, among the seven family types is reported in Table 2. This table indicates that of the households within the one fifth of the population with the lowest incomes, 39% are families composed of a married couple with children under 16, a further 13% are households composed of married couples with the head over 65 years, and 12.4% more are unattached individuals over 65 years. Single parents with children under 16 make up 8.1% of the low income quintile. Married couples without children under 16 and unattached individuals under 65 account for only 5.9% and 7.1% respectively of the low income quintile.

In contrast these two groups account for 44.9% and 30.8% respectively of the highest income quintile. Married couples with children and a household head under 65, married couples with heads over 65, unattached individuals over 65 and single parents with children under 16 are relatively less predominant in the fifth income quintile accounting for 9.3%, 3.1%, and 2.8% and 0.4% respectively of the total households.

Table 3 reports the distribution of households within each income quintile, among the seven employment status classes. Table 4 reports the distribution of households, within each income quintile, among the six educational attainment classes and Table 5 report their distribution among the four household tenure classes.

TABLE 2. DISTRIBUTION OF HOUSEHOLDS BY FAMILY TYPE FOR FIVE INCOME STRATA

	First Quintile	Second Quintile	Third Quintile	Fourth Quintile	Fifth Quintile
			(percent)		
Married couples with no children under 16, head under 65 years	5.9	10.1	23.6	37.5	44.9
Married couples with children under 16, head under 65 years	39.0	54.6	45.5	26.7	9.3
Married couples with head 65 or over	13.5	9.1	5.6	4.0	3.1
Unattached individuals under 65 years	7.1	4.7	8.1	16.2	30.8
Unattached individuals 65 years or over	12.4	8.1	3.9	3.4	2.8
All other families	14.0	11.1	11.8	11.7	8.7
Single with children under 16 years	8.1	2.3	1.5	0.5	0.4
Total	100.0	100.0	100.0	100.0	100.0

Source: As for Table 1.

TABLE 3. DISTRIBUTION OF HOUSEHOLDS BY EMPLOYMENT STATUS CLASS FOR FIVE INCOME STRATA

	First Quintile	Second Quintile	Third Quintile	Fourth Quintile	Fifth Quintile
			(percent)		
Male Head full time; Female Head full time	4.2	9.6	19.6	33.0	52.2
Male Head full time; Female Head part time	10.0	21.4	25.0	22.1	15.8
Male Head full time; Female Head, unemployed	33.5	43.7	35.6	26.5	18.5
Male Head part time; Female Head, full time	1.6	2.9	4.0	6.0	4.7
Male Head unemployed Female Head Full time	0.9	1.3	1.3	0.7	0.7
Male Head part time; Female Head part time	11.1	8.8	8.5	7.8	5.2
Male Head unemployed; Female Head unemployed	38.7	12.3	6.0	3.9	2.9
Total	100.0	100.0	100.0	100.0	100.0

Source: As for Table 1.

TABLE 4. DISTRIBUTION OF HOUSEHOLDS BY EDUCATIONAL ATTAINMENT CLASS FOR FIVE INCOME STRATA

	First Quintile	Second Quintile	Third Quintile	Fourth Quintile	Fifth Quintile
			(percent)		
Less than Grade 9	44.3	26.7	20.5	13.6	6.9
Partial Secondary	29.3	27.7	26.4	23.9	15.0
Complete Secondary	13.4	21.8	21.0	25.6	22.4
Non-university post secondary	6.6	10.9	13.9	13.9	16.8
Partial University	3.0	4.6	5.0	6.2	6.8
University degree	3.4	8.3	13.2	16.8	32.1
Total	100.0	100.0	100.0	100.0	100.0

Source: As for Table 1.

TABLE 5. DISTRIBUTION OF HOUSEHOLDS BY TENURE TYPE FOR FIVE INCOME STRATA

	First Quintile	Second Quintile	Third Quintile	Fourth Quintile	Fifth Quintile
			(percent)		
Home owned without mortgage	22.7	20.0	19.6	17.8	15.1
Home owned with mortgage	16.8	34.3	36.6	31.7	28.8
Tenant	52.9	39.7	38.9	44.7	48.6
Other Tenure	7.6	6.0	4.9	5.8	7.5
Total	100.0	100.0	100.0	100.0	100.0

Source: As for Table 1.

IV.1.2 Engel Functions

In order to eliminate market price variation within the data under consideration, Engel functions were estimated for individual annual cross sections of the Full budget data set. A demographic scale composed of the single variable "family size" was used. This was done to provide a link with previous studies at Agriculture Canada which used the same expenditure variables.

The estimated Engel functions are presented in Tables I.1 through I.6 of Appendix I. The estimates in Table I.1 are those estimated from each of the four Full budget surveys separately. Tables I.2 through I.6 present estimates from the 1978 Full budget survey. Table I.2 presents results obtained by partitioning of the data into five income strata based on the per capita income level of the family. Table I.3 presents estimated Engel functions for each of seven family types. Table I.4 reports Engel function estimates for families of each of seven employment status categories. Engel functions for families in each of six classes of educational attainment of the family head can be found in Table I.5. Finally, Table I.6 gives estimated Engel function coefficients for families in each of four classes of family dwelling tenure.

In general the estimated coefficients are statistically positive for income at a 5% level of significance. The R^2 statistics indicate that the variations in the dependent variable of the Engel functions are only partially explainable in terms of the variation in the independent variables. The explanatory power of the Engel functions could be increased through inclusion of other relevant family characteristics, and by accounting for interspatial price variability in the data.

The elasticities of quantity demanded with respect to total expenditure and with respect to the demographic scale variable, family size were calculated for estimated Engel functions in Table I.1

through I.6 and are reported in Tables II.1 through II.6 respectively. The elasticities from Table II.2 for the five income strata are discussed below. Some of the results presented in Table II.1 and in Tables II.3 through II.6 are highlighted.

Table II.2 indicates that food at home is a necessary good for all income quintiles, while food away from home is a luxury good. Total food is a necessary good. In constrast, non-food is estimated for each of the five income strata to be a luxury good.

The estimated Engel function expenditure elasticities for total food may be compared to other estimates in the literature. This study finds values of 0.40, 0.50, 0.46, 0.51 and 0.57 for the lowest to highest income strata respectively for 1978. Slightly lower values of 0.36, 0.31, 0.35, 0.42 and 0.50 for the lowest to highest income stata respectively have been estimated from 1972 survey data.[2] The expenditure elasticity estimates for total food for all families in Table II.1 also indicate a slightly higher value for 1978 of 0.50 as compared to a 1972 value of 0.45.

The food away from home expenditure elasticities range from 1.57 to 1.60 for the two lowest income strata to 1.30, 1.25 and 1.03 for the third, fourth and fifth strata respectively.

The expenditure elasticities for non-food show the same pattern as those for food away from home with the lowest income strata showing the highest value of 1.24, and the high income strata showing the lowest value of 1.10. This could be explained as a result of the upper income quintile having more income to satisfy their preferences and thus having lower total expenditure elasticities.

The Engel function estimates include a single scale variable, family size. The elasticities of quantity demanded with respect to family size calculated from these estimates are reported in Table II.2. For food at home the family size elasticity is positive and increases with income level. In contrast, actual family size decreases with a rise in income level. Average household size for households in the first quintile is 3.38, for households in the second is 3.44, and for those in the third, fourth, and fifth quintiles the averages are 3.12, 2.53 and 1.93 members respectively. A plausible explanation for the increase in family size elasticity with income level is that the larger families in the lower income quintiles are able to achieve some economies of scale in food at home consumption and thus require a lower incremental outlay to provide for an incremental family member than do the smaller families in the upper income groups.

The estimated family size elasticities for total food are positive and range from 0.44 for the lowest quintile to 0.32 for the highest income quintile. These estimates are of the same sign and of similar magnitude to reported estimates from a linear Engel function of 0.36, 0.38, 0.38, 0.38, and 0.33 for the lowest to highest income quintile respectively.

For food away from home and for non-food the family size elasticities for all five income groups are negative showing that the additional food expenditure required to provide for an incremental family member is made at the expense of reducing luxury goods spending. For non-food the elasticity is most negative for the lower income strata and becomes progressively less negative with increasing income.

Turning now to some of the highlights of other tables, it can be seen in Table II.3, by comparing households composed of married couples with no children under 16 years of age and households composed of married couples with children of less than 16 years, that the effect of children in the household is to increase the income elasticities for both food at home and food away from home.

Unattached individuals under 65 years have the lowest Engel function total expenditure elasticities for food at home and for food away of the seven family types.

Of the various employment status classes, the highest elasticity of demand for food at home with respect to total expenditure is 0.36 for households in which both the male and female heads are employed part time, while the lowest value, of 0.13, was found for households in which the female head works full time and the male head is not employed or there is no male head. These latter households were also found to have the highest elasticitiy of demand for food away from home with respect to total expenditure perhaps indicating that the male heads of these households would prefer to eat less at home and more outside the home. The lowest elasticity of demand for food away from home with respect to total expenditure was found for households in which both male and female heads were employed full time. One possible explanation is that these households already consume a substantial number of meals away from home as a convenience to save time and effort involved in home cooking.

IV.1.3 Food, non-food demand system

The estimates of the food, non-food demand system are reported in Table III.1.A for the total data sample and in Tables III.2.A through III.6.A for the various partitions of the data examined. It can be seen that the estimated coefficients are generally significantly different from zero. The demand system was estimated using a demographic scale including one variable, that being the household size measured in number of members.

The elasticities of demand with respect to the price of food, with respect to the price of non-food, with respect to total expenditure and with respect to household size are reported in Tables IV.1.A through IV.6.A.

The elasticities of demand for food and for non-food for the complete sample of all households are reported in Table IV.1.A. The values of the price elasticities for food and non-food indicated that both are price inelastic for the aggregate of households.

The estimated elasticity of food demand with respect to food price, (the own price elasticity for food), is -0.35. In comparison, estimates from time series data on Canadian food consumption have reported own price elasticities for food ranging from -0.26 to -0.46 depending upon the mathematical form of the estimating equations.[3] The estimated own price elasticitiy of demand for non-food is -0.97. Few other studies have estimated demand elasticities for an aggregate "non- food". However these other estimates indicate a range of -.79 to -1.02.[4] Both of the cross price elasticities of demand are negative indicating at this degree of aggregation food and non-food are uncompensated complementary goods. The estimated elasticity of food demand with respect to non-food prices is -0.12 while the estimated elasticity of non-food demand with respect to food prices is -0.19. The utility constant or income compensated price elasticities of demand may be calculated from the market response or uncompensated elasticities reported in Table IV.1.A as the sum of (i) the uncompensated elasticity and (ii) the income elasticity weighted by the share of the good whose price changes. The compensated own price elasticities are -0.24 for food and -0.07 for non-food. The compensated cross elasticity of food demand with respect to non-food price is 0.24 while that of non-food demand with respect to food price is 0.07. The positive values of the cross price elasticities indicate that food and non-food are compensated substitutes. This relationship is imposed by the nature of a two good relationship.

The estimated elasticity of food demand with respect to total expenditure is 0.46, indicating total food is a necessary good. This finding is consistent with the Engel function estimates in Table II.1 which range from 0.42 to 0.50. The estimate of 0.46 is also comparable with other estimates of the elasticity of food demand with respect to income of 0.22 to 0.86. These are equivalent to elasticities with respect to total expenditure of 0.24 to 0.92.[5] The estimated elasticity of non-food demand with respect to total expenditures is 1.15 which classifies non-food as a luxury good. This finding is also consistent with the Engel function estimates in Table II.1 and is within the range of estimates of 1.10 to 1.38 reported by other researchers.[6]

The estimated family size elasticities are 0.38 for food and -0.11 for non-food. The value of 0.38 for food indicates by its sign that food is a necessary good and that there are economies of scale in food consumption. The increased proportion of family's total expenditure devoted to food results in a lower level of non-food expenditure, ceteris paribus, thus accounting for the negative sign of the non-food elasticity.

The estimates for the third quintile are atypical in other respects. Firstly food and non-food are uncompensated complements, except for the third quintile where food is a price substitute for non-food, and non-food is a price complement for food. The compensated cross price elasticities of food demand with respect to non-food price are all positive as expected. They are 0.18, 0.13, 0.39, 0.20 and 0.26 for quintile one to five respectively. The compensated cross elasticities of non-food demand with respect to food price are 0.07, 0.04, 0.11, 0.05 and 0.06 for the lowest to highest income group respectively. These results reveal that it is the higher value of the compensated substitution effect for the third quintile which causes the atypical coresponding uncompensated elasticity value.

Secondly, non-food is estimated to be a price elastic good for the third income quintile, while it is a price inelastic good for other quintiles. The compensated elasticities for non-food reveal that for all quintiles the pure own price effect is small, but that for the third quintile it is relatively large. The compensated non-food own price elasticities are -0.08, -0.05, -0.11, -0.05, and -0.06 for quintile one to five respectively. Again the third quintile shows a higher pure substitution response. While the cause of this phenomena is not identified, the reader may wish to examine the demographic and socio-economic composition of the third quintile (Tables 2 through 5) for possible explanations.

The total expenditure elasticities for both non-food and food show clear trends across income groups. The value for non-food declines from 1.25 for the low income quintile to 1.10 for the high income group. The total expenditure elasticities for food increase with increasing income from 0.37 for the low incomes quintile to 0.56 for the highest income quintile. These estimates are of the same general magnitude as those of the Engel function estimates in Table II.2 and it appears that the price variables of the demand equations have reduced the price induced bias present in the Engel estimates, allowing the trend over income levels to be seen clearly.

Looking briefly to Table IV.3.A it can be seen that for single adults with children under 16 years of age the estimated own price elasticity for food is positive 0.03. This result, if valid, would indicate that food was a Giffen good for these families. For any good to be a Giffen good, it is necessary that it be inferior, and that it make up a large enough portion of the total budget that the perverse income effect of a change in own price is greater than the price effect. For families composed of a single adult with children under 16, food is not an inferior good and the proportion of food expenditure in the budgets of these families is 25% of their total expenditure, as compared with an average of 20% for all households. Thus food is likely not a Giffen good for these households. Possibly the positive estimated elasticity results from not using an appropriate estimating methodology to account for observations of zero expenditure for meals away from home.

For the various employment status classes reported in Table IV.4, examination of the estimated own price elasticities of demand for food reveals that the elasticities generally increase with declining levels of employment of the male and female heads of the household from a value of -0.50 for households in which both are employed full time to -0.02 for households in which both are employed part time. A similar pattern can be seen in the non-food own price elasticities which range from -1.00 for households in which both the male and female heads are employed full time to -0.86 for households in which both are employed part time. These results may reflect that families with two wage earners have higher levels of disposable income available with which to take advantage of price variation, while households with low levels of employment may out of necessity allocate a larger portion of expenditure toward necessary goods which must be purchased irrespective of price fluctuations.

The elasticities in Table IV.6 indicate that of the various tenure types homeowner with a mortgage have the highest own price elasticity of demand for food, -0.53, and the highest non-food own price elasticity, -1.00, of the four groups. This group's high degree of price responsiveness may be a result of their having a relatively smaller proportion of their budget uncommitted after mortgage payments. This group also exhibits the highest elasticity of demand for food with respect to total expenditure, 0.54.

IV.1.4 Food at home, food away, non food demand system

The estimated systems of equations describing the demand for food at home, food away from home and non-food goods are reported in Tables III.1.B through III.6.B. These systems were estimated using a demographic scale composed of one variable, family size. In general the estimates of the coefficients of the total expenditure and family size variables are statistically different from zero. In contrast certain of the coefficients of the price variables are not statistically different from zero. In particular the cross-price coefficient of food away in the food at home equation, and that of food at home in the food away equation are generally not statistically different from zero. In a number of cases the own price and cross price coefficients for food away from home are not estimated to be significantly different from zero.

The elasticities of demand which characterize Canadian consumers allocation of total current expenditure among food at home, food away from home and non food expenditures are reported in Table IV.1.B for all consumer households in the data, and in Tables IV.2.B through IV.6.B for the various classifications of the data by socio-economic and demographic characteristics.

Examination of Table IV.1.B reveals that food at home is a price inelastic necessary good. Food away is also price inelastic, but is a luxury commodity. The cross price effects between food at home and food away are not well estimated and therefore should be interpreted with caution. Food away is estimated to be an uncompensated price substitute for food at home consumption while food at home is estimated to be an uncompensated price complement to food away consumption. The compensated cross price elasticities of food at home demand with respect to food away price of 0.07 and of food away demand with respect to food at home price of 0.26 indicate the two are compensated substitutes.

Non food is estimated to be a slightly inelastic luxury good. The high total expenditure elasticity in combination with the large proportion of non food in the budget result in its compensated own price elasticity being a relatively low -0.07. Non food and food away are estimated to be uncompensated complements in consumption, and compensate substitutes. The compensated elasticity of non food demand with respect to food away price is 0.02 and that for food away demand with respect to non food price is 0.32. As Table IV.1.B reports, the uncompensated cross elasticities between food at home and non food are of opposite sign, however the compensated values are positive indicating the two goods are substitutes.

As was discussed in Section III.1 the estimated consumer demand response parameters estimated from time series data may differ from those estimated using data from the household budget surveys, and may reflect different aspects of the adjustment process. Estimated demand elasticities for food at home, food away from home and non food estimated from Canadian time-series (National Accounts) expenditure data are reported in Table 6. Comparison of the estimated own price elasticities of demand reveals that those estimated from the household budget data are more negative than those estimated from time series data. This tends to support the hypothesis that budget data estimates may represent a longer run adjustment than do time series estimates. Most of the cross price elasticities are of similar value in estimates from both data sets.

TABLE 6. ELASTICITY MATRIX - TIME SERIES ESTIMATES

	Food at Home	Food Away from Home	Non Food	Total Expenditure
AIDS				
Food at home	-0.112	0.027	-0.273	0.360
Food away from home	0.007	-0.344	-0.605	0.948
Non food	-0.185	-0.043	-0.908	1.136

Source: See Note 7.

The total expenditure elasticities from the two data sets are very close for non food. The estimate from budget data is 1.15 while that from time series is 1.14. The estimated total expenditure elasticity for food at home is 0.18 from budget data and 0.36 from time series data, while the total expenditure elasticity for food away from home is estimated to be 1.61 from household budget data and 0.95 from time series data.

The two sets of estimates are generally consistent although the differences in the estimated parameters tend to support the hypothesis that time series estimates capture shorter run effects than do budget data estimates, or estimates from a series of budget surveys. It is likely that the underlying dynamics of the processes determining changes in the aggregate expenditure patterns in time series data are composed of price and income effects and also of demographic and structural variations. Estimates from budget data would tend not to capture the demographic and structural variations and would tend to more closely approach estimates of long run or static equilibrium shifts.

The study cited in Section III.1 (see Note III.6) which found little difference between demographic variable estimates from household budget data and from pooled household budget and time series data hypothesized that this result indicated that adequate modelling of the demographic effects in the household data would capture the underlying dynamics in the aggregate expenditure patterns in time series data. Thus the adequate modelling of demographic effects in the estimating model applied to budget data should provide estimates which adequately capture the effects of prices and income on individual consumer demand and as well demographic variation which also affects aggregate demand.

The estimates reported in Tables IV.2.B through IV.6.B examine the demand parameters of specific classifications of the households in the data, each according to categorization by one socio-economic or demographic characteristic of the household. If the proportions of the population in each of the categories of any one classification is known, aggregate values for the demand parameters could be calculated as a weighted sum of the estimates for each of the categories. As the demographic profile of the population changed this weighted sum would reflect the variation. Alternately estimates of aggregate changes in consumer demand could be developed from the estimates by classification through firstly calculating the change in consumption of households of each type within the classification, and then summing using weights go the proportion of each type of household within the population as a whole.

Perhaps a preferable method would be to specify the estimating equations so as to include a demographic scale which includes all of the demographic characteristics on which the classifications were based. The estimates from a system of such equations would more fully capture the classical price and income effects and also the effects of demographic variations.

The estimated own price, total expenditure and family size elasticities for food at home, food away, and non-food for five per capita income strata presented in Table IV.2.B permit examination of the variations in these parameters with income. It can be seen that each of the three goods is price inelastic for each income group with the exception of food away from home for the first income quintile, which is estimated with a low degree of precision, and of non food for the third income quintile. The latter elasticity is estimated to be 1.02 although the estimate is not statistically greater than one. While the relationships between own price elasticity and income class for food at home and food away, are not strictly proportional there are general tendencies evident. The own price elasticity for the aggregate food at home tends to become more negative with increasing income. In contrast, the own-price elasticity for food away becomes less negative with increased income level, and the non-food own price elasticity shows no pattern over the five income quintiles.

The utility constant or income compensated price elasticities calculated from Table IV.2 are presented in Table 7. The food at home compensated own price elasticity shows the same tendency as its uncompensated counterpart, becoming more negative with increasing income. The meals away elasticity tends to become less negative with increasing income and the non-food compensated elasticity is relatively trendless.

It may be that the low income quintile households maintain their buying habits and eating preferences fairly rigidly in response to the shifts in food prices and that the upper income groups are more price responsive due to the financial ability to search out lower cost specials, to buy larger quantities at the lower prices, and to purchase and maintain storage equipment such as freezers.[8]

The cross price elasticities show few trends across income groups, with the exception of the elasticity of demand for non-food with respect to food prices which becomes less negative with increasing income indicating that for upper income groups non food consumption is less affected by food prices than is the case for the poor. Food away and non food are uncompensated price complements for each other for all income groups. Non food can be seen to be a price complement to food at home for the two lower income quintiles and a price substitute for the three upper income quintiles. This may be due to the fact that lower income households typically have a greater proportion of their income committed to necessary consumption and are less able to respond to price changes than are upper income households.

TABLE 7. INCOME COMPENSATED ELASTICITIES FOR FOOD AT HOME, FOOD AWAY AND NON FOOD BY INCOME QUINTILE

Quantity of	With Respect to the Price of		
	Food at Home	Food Away	Non Food
Food at Home			
Quintile 1	-0.226	0.074	0.152
Quintile 2	-0.180	0.043	0.137
Quintile 3	-0.462	0.059	0.403
Quintile 4	-0.638	0.217	0.421
Quintile 5	-0.332	0.027	0.305
Food Away			
Quintile 1	0.676	-1.319	0.633
Quintile 2	0.209	-0.212	-0.007
Quintile 3	0.234	-0.519	0.277
Quintile 4	0.673	-0.030	-0.646
Quintile 5	0.066	-0.193	0.123
Non Food			
Quintile 1	0.061	0.018	-0.078
Quintile 2	0.040	-0.002	-0.037
Quintile 3	0.093	0.014	-0.107
Quintile 4	0.081	-0.040	-0.041
Quintile 5	0.043	0.011	-0.054

The calculated compensation price elasticities in Table 7 tend to support this conjecture. It can be seen that food at home and non food are compensated substitutes and that the pure substitution response of the two lower income quintiles is less than one half that of the third and fourth quintiles, and about one half that of the fifth.

The figures in Table 7 reveal that food at home and meals away are compensated substitutes for all income groups, as would be intuitively expected. Meals away and non-food are also estimated to be compensated substitutes for the first, third, and fifth income quintiles, and complements for the fourth quintile. The compensated elasticity for the second quintile is of very small magnitude. The meals away is a price complement to non food consumption and non food is a price substitute to meals away consumption.

The expenditure elasticities indicate that food at home is a necessary good for each of the income quintiles and that food away from home and non-food are luxury goods for all groups. As expected the total expenditure elasticity for each of the three goods generally declines in magnitude with increasing income, although the declines are not large. These elasticities show some variation from the Engel function estimates of Table II.2, both because the Engel function estimates are for 1978 only while those from the demand system are for all four survey years, and because the Engel function estimates are subject to omitted variable, price variation induced, biases.

The family size elasticity for food at home is positive and less than one for all quintiles indicating economies of scale in consumption. The negative values of the meals away and non-food elasticities are a reflection of the fact that larger families typically have more younger members who have lower consumption preferences for these goods.

Highlights of Tables IV.3.B through IV.6.B present the estimated elasticity matrices by other socio-economic characteristics. Among the family types in Table IV.3.B the total expenditure elasticity for food at home is lowest for households composed of unattached individuals under 65 years (0.02) and for married couples whose head is less than 65 years of age and who have no children (0.10) and is highest for unattached individuals aged 65 years and over (0.40). The estimated own price elasticity for meals away from home ranges from -0.42 for unattached individuals aged less than 65 years to -1.9 for single parents with children under 16. This indicates that meals away from home are somewhat of a staple for the former group and that the latter group is decidedly more flexible to price.

One anomalous result is the positive value of the estimated own price elasticity for meals away from home for unattached individuals aged 65 years and over. The utility constant or expenditure compensated value of this elasticity is also positive. The explanation seems to lie in the relatively small number of households in this group and the relative lack of variability in the data which resulted in an estimated parameter which is not statistically different from zero. Within the statistical confidence interval of the estimated parameter the elasticity takes negative values.

The total expenditure elasticity for food away from home is greater than one for all family types indicating eating out is a luxury item in consumption. The estimates range from 1.33 for unattached individuals under 65 years of age, for whom meals away consumes a larger budget proportion than for other family types, to 1.96 for single parent families, for which restaurant meals are more of a treat.

The variations in the elasticities of demand between households in various employment status of the male and female heads of the household classes can be examined in Table IV.4. For households in which the male head is employed full time, the total expenditure elasticities vary inversely to the working time of the female head. Looking at the own price elasticities for these three employment status classes reveals that the own price elasticities for food at home and meals away from home are higher for households with the male head employed full time and the female head employed part time. Perhaps these households have both the income level and the time available to more easily adjust their food consumption to changing prices. The family size elasticities for food at home for households with the male head employed full time decline with declining employment of the female head. The family size elasticities for meals away from home become less negative with decreasing employment of the female head. These family size elasticity variations perhaps indicate the scarceness of non working time for households with both heads employed results in fewer economies of scale in household food consumption than are realized by households where the female head is not employed.

It is also of some interest to compare households in which both heads are employed full time with households in which both are employed part time and with those in which both heads are unemployed. Households in these three employment status classes exhibit total expenditure elasticities for each of food at home, food away and non food which increase as their employment level decreases. The own price elasticities for these three employment status classes for food at home and for food away are higher for households with both heads employed part time.

Turning now to compare the estimated elasticities for households with both heads employed full time with households with the female head employed full time and the male head employed part time with those in which the male head is not employed reveals two results of interest. First, the total expenditure elasticity for food at home is positively correlated with the male heads employment, while the non food total expenditure elasticity is inversely correlated with the employment of the male head. The second result of interest concerns the family size elasticities. The family size elasticities for food at home are positive for all three employment status classes and those for non food are negative for all three. The family size elasticity for meals away from home is negative, as expected, for households with both heads employed full time and for households with the male head employed part time. However for households in which the male head is unemployed the family size elasticity is positive and statistically significant. For this household type the addition of an extra member results in approximately the same proportionate increases in food at home and food away from home demand perhaps indicating that male homemakers are not inclined to realize household economies of scale in food consumption by significantly increasing the proportion of at home eating.

Table IV.5 presents the elasticities of demand for food at home, food away and non food for households within each of six classes of educational attainment of the head of the household. The total expenditure elasticity for meals away from home generally declines with increasing education. For non food the total expenditure elasticity is inversely proportional to educational attainment class. This finding may be the result of a positive correlation between educational attainment and income combined with a negative correlation between consumption and income.

The elasticities which characterize the demand responses of households of four classes of tenure of the family dwelling are reported in Table IV.6. Homeowners with a mortgage outstanaing on their home were found to have the most negative own price elasticity, the largest total expenditure elasticity for food at home and the smallest family size elasticity for food at home. This type of household may exhibit these responses due to its having a large portion of its total expenditure committed to mortgage payments. Lending support to this speculation are the elasticities of demand for non food for this household tenure type. Homeowners with a mortgage have the highest own price elasticity for non food and also the lowest total expenditure elasticity for non food. In addition the family size elasticity for non food for homeowners with a mortgage is relatively low. In contrast renters, who also make a proportionately large monthly payment, are the least responsive in the consumption of food at home to food at home prices, have a lower total expenditure elasticity for food at home, and a higher family size elasticity for food at home, than homeowners with a mortgage. In their demand for meals away from home, renters are most responsive to changes in the prices of meals away. They also show the highest total expenditure elasticity for meals away from home and the lowest own price elasticity for non food.

IV.2 Statistical tests

Statistical tests of several of the hypotheses of demand theory and of the relative explanatory power of different demographic scales were made. The test statistic used was the likelihood ratio test.9 The hypotheses of homogeneity of degree zero in prices and total expenditure and of symmetry of the matrix of utility constant subsitution terms were tested for the food at home, food away, and non food demand system. The test of homogeneity was made using an estimating equation form which did not include demographic scaling variables. (The inclusion of a demographic scale in the non-homogenous form of the AIDS renders it non-linear in the estimating parameters and resource constraints prohibited estimation of a system of non-linear demand equations.) The test statistic of 138 is evidence for one rejection, the validity of the hypothesis of homogeneity.

TABLE 8. STATISTICAL TESTS

Hypotheses of Theory

	Functional Form Excl. Family	Functional Form Incl. Family Size
Homogeneity: Unrestricted	$X^2_2 = 138$	-
Homogeneity & Symmetry: Homogeneity	$X^2_1 = 2$	$X^2_1 = 22$

Effect of Household Size Variable in Homogenous System

Household Size Excluded:	Unrestricted Coefficient of Household Size
	$X^2_1 = 7098$

The hypothesis of symmetry as an additional restriction was tested both for the estimating equation excluding a demographic scale and for the estimating equation which included a demographic scale consisting of one variable, family size. The test statistic of 2 for the system without a demographic scale, and of 22 for the system with the scale indicates that the hypothesis of symmetry as an additional restriction is not statistically rejected for the functional form excluding household size but is for the form including household size.[10]

The statistical rejection of the hypotheses of homogeneity and symmetry is often found in studies using time series data on aggregate market demand. It is argued that this rejection occurs because of the bias of the commonly used test statistics toward rejection when using small samples of data as time series estimations typically do. It has also been argued that the symmetry restrictions will hold for market demands only under fairly restrictive assumptions about the distribution of income and on individual preferences.[12] Thus rejection of symmetry of market demands may indicate a rejection of these underlying assumptions on income distribution and consumer preferences, while symmetry may continue to hold for the individual consumer.

The results reported above from the more than 14,000 observations in the Full budget data set should not suffer from test statistic-bias. Additionally, the AIDS with a demographic scale, which was used to perform one of the tests of symmetry, allows a certain amount of variation in the preferences of individual households. Curiously the functional form including the demographic scale more strongly rejects the hypothesis of symmetry than does the form without the demographic sale. Given this evidence one could argue that the hypotheses only apply to the individual consumer and not to larger aggregates of consumers, or that the scale used did not allow sufficient variability of preferences or alternatively that durable goods expenditure and stock effects are not well modelled in a static model and that this could result in rejection.

While the problem of reconciling the applied theory with the data remains unsolved, it is the preference of many applied demand analysts to assume that the hypotheses of homogeneity and symmetry ought to be met and to impose them.

The system of demands for food at home, food away from home and non food was also estimated using a demographic scale consisting of that single variable family size. The test statistics comparing this estimating system to one in which the demographic scale variable family size is excluded, or its coefficient is restricted to be zero, is 7098 indicating the improved statistical explanatory power which the inclusion of the demographic scale provides.

IV.3 The allocation of food expenditure

IV.3.1 Descriptive analysis of the data

Data were obtained from Statistics Canada Surveys of Urban Family Food Expenditure for 1974, 1976 and 1978, (section IV.1.1 and data sources for Table 1).

The average household food expenditure level for the data from the food budget surveys for all three years was $48.43 per week. The average weekly household expenditure for food varied from $27.83 for the lowest income quintile to $70.64 for the highest income quintile. Table 9 shows that the difference between the low and high income quintile's food at home expenditures is comparatively smaller. The average household in the data expended $35.22 per week on food for home consumption while the households in the low income quintile spent $22.63 per week on average and the average household in the upper income quintile spent $46.47 per week.

Table 9 reveals that the proportion of food at home expenditure allocated to meats, poultry and fish is the largest allocated to any of the seven foods at 34 percent of the total. Expenditure on the miscellaneous category makes up another 18 percent of the food at home budget as does expenditure on fruit and vegetables. Dairy products account for a further 15 percent of the food at home budget of the average household in the data, while the expenditure on cereal and bakery products accounts for 11 percent. A relatively minor 2.4 percent goes to the purchase of fats and oils with the final 2.3 percent spent on eggs.

Examination of the shares of aggregate food at home expenditure in Table 9 and of the shares of aggregate total food expenditure in Table 11 reveal certain patterns in food consumption. As expected, the share of food at home expenditure allocated to meat rises with increasing income. The lowest income quintile households spend in aggregate 31.8 percent of their food at home expenditure on meat, poultry and fish while the average upper income quintile household allocates 35 percent of their food at home expenditure to this food category. Table 9 shows that the share of food at home expenditure allocated to cereal and bakery goods declines with increasing income as does the share allocated to fats and oils, that to eggs and that to miscellaneous foods. Thus it may be concluded that lower income groups obtain a greater proportion of their caloric intake in the form of starches, fats and oils and use more eggs as a source of protein.

TABLE 9. ESTIMATING DATA: MEAN EXPENDITURE LEVELS AND EXPENDITURE SHARES FOR SEVEN FOOD DISAGGREGATION, BY INCOME STRATA, FOR THE 1974, 1976 AND 1978 FOOD BUDGET SURVEYS

	All Households	Income Quintile					Unclassified
		1	2	3	4	5	
Expenditures							
Dairy Products Including Butter	5.1821	3.2816	4.5238	5.5949	5.9731	6.7884	5.6178
Cereal and Bakery Products	3.9381	2.6291	3.5815	4.1422	4.5423	5.0350	3.9653
Fats and Oils	0.8381	0.5993	0.7707	0.8887	0.9400	1.0333	0.8473
Eggs	0.7996	0.5775	0.7244	0.8484	0.8991	0.9828	0.8288
Fruits and Vegetables	6.1660	4.0418	5.4013	6.3186	7.1677	8.2875	6.5151
Meat, Poultry and Fish	11.9320	7.2005	10.2002	12.5656	14.0864	16.2720	13.1581
Miscellaneous Foods	6.3637	4.3002	5.6881	6.8598	7.3714	8.0723	6.0353
Total Food at Home Expenditure	35.2196	22.6300	30.8880	37.2182	40.9800	46.4713	36.9677
Shares of Aggregate Food-at-Home Expenditures							
Dairy Products Including Butter	.14714	.14501	.14646	.15033	.14576	.14608	.15197
Cereal and Bakery Products	.11182	.11618	.11595	.11130	.11084	.10835	.10726
Fats and Oils	.02380	.02648	.02495	.02388	.02294	.02224	.02292
Eggs	.02270	.02552	.02345	.02280	.02194	.02115	.02242
Fruit and Vegetables	.17507	.17860	.17487	.16977	.17491	.17836	.17624
Meat, Poultry and Fish	.33879	.31818	.33023	.33762	.34374	.35015	.35594
Miscellaneous Foods	.18069	.19002	.18415	.18431	.17988	.17371	.16326

IV.3.2 Seven food groupings

IV.3.2.1 Engel functions

Engel functions estimated using total expenditure on food at home were estimated for the seven food groups and are reported in Tables V.1.1, V.1.2, and V.1.3 for data from the years 1974, 1976 and 1978 respectively. The estimates are generally statistically significantly different from zero as can be seen from the reported standard errors.

TABLE 10. ENGEL FUNCTION ELASTICITIES OF DEMAND WITH RESPECT TO FOOD AT HOME EXPENDITURE

Commodity	1974	1976	1978
Dairy	0.7115	0.7810	0.8242
Cereal and Bakery Products	0.8671	0.8985	1.0055
Fats and Oils	1.1650	1.0572	1.1094
Eggs	0.8447	0.8978	0.8825
Vegetables and Fruits	0.9838	1.0156	1.0539
Meat, Poultry and Fish	1.1936	1.1698	1.1960
Miscellaneous	0.9285	1.0313	1.0422

Elasticities of demand with respect to total food at home expenditure were calculated from the estimates and are reported in Table 10. Elasticities of demand with respect to total expenditure were calculated as the product of the elasticities with respect to total food at home expenditure and the calculated value of the food at home Engel function elasticities by year from Table II.1. All the calculated elasticities with respect to food at home expenditure are of the expected positive sign.

TABLE 11. ENGEL FUNCTION ELASTICITIES OF DEMAND WITH RESPECT TO TOTAL EXPENDITURE

Commodity	1974	1976	1978
Dairy	.1481	.1234	.1543
Cereal and Bakery Products	.1841	.1420	.1882
Fats and Oils	.2424	.1671	.2076
Eggs	.1758	.1419	.1652
Vegetables and Fruits	.2047	.1605	.1972
Meat, Poultry and Fish	.2484	.1880	.2238
Miscellaneous	.1932	.1630	.1951

The elasticities with respect to total expenditure reported in Table 11 show that all food groups are "necessary" goods and that the meat, poultry and fish group is most expenditure elastic, with the fats and oils group coming second. The estimates for 1974 and 1978 indicate that Vegetables and Fruits is the third most expenditure elastic food group with miscellaneous foods being fifth. In contrast, the 1976 estimates indicate a reversal in the relative order of these two groups. The cereal and bakery products group is the next most expenditure elastic for all three years with eggs and dairy products being the second least and least expenditure elastic food groups.

In general the estimated total expenditure elasticities are lower for 1976 than for the other two years, due to a lower value of the elasticity of food at home expenditure with respect to total expenditure estimated for 1976. The food at home expenditure elasticities for four of the food groups, dairy, cereal and bakery, vegetables and fruits, and miscellaneous foods increase in value over time, from 1974 to 1978. The food at home elasticities for the other three commodities show no readily discernible trends.

IV.3.2.2 Single demand equations

The estimates of single demand equations for each of the seven food groups are reported in Table V.2.1. The estimates were made excluding a demographic scale.

The R^2 statistics for the estimated equations range from 0.008 to 0.14. The estimated coefficients are generally statistically different from zero, although the coefficients of the diary variable are somewhat less significant in general. This may be due to the high percentage of observations of nil purchase of dairy products by households during the two-week survey period. If so, then use of a Tobit estimator would likely produce estimates with lower variances, which would also be consistent.

The elasticities of demand with respect to the own prices of each of the seven foods and with respect to total food at home expenditure and to total expenditure are presented in Table 12.

In accordance with a priori expectations all foods are estimated to be "normal" and "necessary", as indicated by total expenditure elasticities having positive values of less than one. The total expenditure elasticities are of the same relative magnitudes as the Engel function elasticities for 1974 and 1978, and in general take on values within the range of estimates from Engel functions for the three years of data.

The own price elasticities reported in Table 12 are all negative as expected according to the theory of demand. The calculated elasticities indicate that all groups are price inelastic and that dairy products is the most price elastic of the food groups. The ordering of the food groups according to relative uncompensated price elasticity proceeds with meat, poultry and fish being second most price elastic, cereal and bakery products third, miscellaneous foods fourth, eggs fifth, vegetables and fruits sixth and fats and oils the least price elastic. The relative ordering according to the value of the income compensated or utility constant own price elasticities reported in Table 12 is somewhat different. The food group estimated to have the most negative compensated price elasticity is dairy products, however the second most negative is cereal and bakery products, the third most negative miscellaneous foods, the fourth eggs, the fifth meat, poultry and fish, the sixth fats and oils and the least price elastic is vegetables and fruits.

The full matrix of uncompensated own and cross price elasticities is reported in Table V.3 Section I, while the full matrix of income compensated or utility constant own and cross price elasticities is reported in Table V.4 Section 1. Examination of the latter Table reveals that dairy products are compensated price complements for fats and oils, eggs, and fruits and vegetables and price substitutes for other foods. Cereal and bakery products are compensated price complements for eggs, fruit and vegetables, and for miscellaneous foods. Fats and oils are compensated price substitutes for dairy products and meat, poultry and fish and price complements for other categories. Eggs are compensated price complements for miscellaneous foods and price substitutes for other foods. Vegetables and fruit is a compensated substitute for cereal and bakery products and for meat, poultry and fish. The meat, poultry and fish food group is a compensated price substitute for eggs, fruit and vegetables and miscellaneous foods. The miscellaneous group is a compensated price complement for cereal and bakery products and for miscellaneous foods and price substitute for all other groups.

IV.3.2.3 Systems of demand equations

The estimated system of demand equations excluding a demographic scale is a reported in Table V.2.2. Examination of the reported standard errors reveals that the coefficients are generally statistically different from zero, although for fats and oils and for eggs four of the seven price coefficients are not. It is interesting to note that the use of the systems estimator has reduced the standard errors of the coefficients for all equations except cereal and bakery products, fats and oils, and eggs. For cereal and bakery products and for fats and oils the systems estimator has produced less statistically significant coefficients in the estimates of the cereal and bakery products equation, and in the fats and oils equation.

The elasticities of demand with res to own price and with respect to total food at home expenditure and to total expenditure are presented in Table 13. As expected all goods are estimated to be "normal" and "necessary" as indicated by total expenditure elasticities which take positive values less than one. The estimates are very close to those obtained using the single demand equation estimator, with the exception of that for miscellaneous foods which is somewhat lower. This could be a result of imposing the Engel aggregation condition on the systems estimates.

The own price elasticities reported in Table 13 are all negative as expected according to the hypotheses of demand theory. All of the seven foods are estimated to be price inelastic. The relative rankings according to the absolute magnitude of the own price elasticity is meat, poultry and fish, cereal and bakery products, dairy products, fats and oils, vegetables and fruits, miscellaneous foods, and lastly eggs. There are few similarities with the relative magnitudes estimated using the single equation estimator, indicating the effect of the increased statistical efficiency of the systems estimator.

The absolute magnitudes of the calculated elasticities from the single equation estimates and the systems estimates is very close for cereal and bakery products and is close for meat, poultry and fish (-.75 vs -.70). For the other foods there are differences.

TABLE 12. EXPENDITURE AND OWN PRICE ELASTICITIES OF DEMAND: SEVEN FOOD DISAGGREGATION, FROM SINGLE EQUATION ESTIMATES

Commodity	Food at Home Expenditure	Total Expenditure
Expenditure Elasticities of Demand		
Dairy	.7847	.1394
Cereal and Bakery Products	.9282	.1649
Fats and Oils	1.1019	.1958
Eggs	.8721	.1550
Vegetables and Fruits	1.0281	.1827
Meat, Poultry and Fish	1.1920	.2118
Miscellaneous	.9992	.1776

Commodity	Uncompensated	Compensated
Own Price Elasticities of Demand		
Dairy	-.8964	-.7810
Cereal and Bakery Products	-.6691	-.5653
Fats and Oils	-.1923	-.1661
Eggs	-.4236	-.4038
Vegetables and Fruits	-.3430	-.1630
Meat, Poultry and Fish	-.7503	-.3465
Miscellaneous	-.6639	-.4834

TABLE 13. EXPENDITURE AND OWN PRICE ELASTICITIES OF DEMAND: SEVEN FOOD DISAGGREGATION, SYSTEMS ESTIMATES

Commodity	Food at Home Expenditure	Total Expenditure
Expenditure Elasticities of Demand		
Dairy	.78291	.13915
Cereal and Bakery Products	.92869	.16506
Fats and Oils	1.1013	.19573
Eggs	.86918	.15448
Vegetables and Fruits	1.0244	.18207
Meat, Poultry and Fish	1.1932	.21206
Miscellaneous	.83814	.14896

Commodity	Uncompensated	Compensated
Own Price Elasticities of Demand		
Dairy	-.58710	-.47190
Cereal and Bakery Products	-.65479	-.55093
Fats and Oils	-.47877	-.45256
Eggs	-.28768	-.26795
Vegetables and Fruits	-.43361	-.25427
Meat, Poultry and Fish	-.69850	-.29427
Miscellaneous	-.36103	-.20959

The expenditure compensated elasticities reported in Table 13 also show some variations from those calculated from single equation estimates. The relative magnitudes, of the own price elasticities are rearranged. The most elastic food is cereal and bakery products. Dairy products is second most elastic, fats and oils third, meat poultry and fish fourth, eggs fifth, vegetables and fruits is sixth and miscellaneous foods is least price elastic. The absolute values of the estimated elasticities for meat, poultry and fish, and for cereal and bakery products is fairly stable between the single equation estimate and the systems estimate. However, the elasticities for the other five food groups all change significantly.

The full matrix of uncompensated own and cross price elasticities as calculated from the systems estimator is reported in Table V.3 Section II while the full matrix of expenditure compensated or utility constant own and cross price elasticities is reported in Table V.4 Section II. Examination of the latter table indicates significant changes compared to the elasticities from single equation estimates. Dairy products are estimated to be a compensated price complement for meat, poultry and fish and price substitute for other goods. Cereal and bakery products are estimated to be a compensated price substitute to eggs, and fruit and vegetables, rather tha a complement. Fats and oils is estimated to be a complement for meat, poultry and fish rather than being a substitute. Eggs are estimated to be a complement for fats and oils and fruit and vegetables rather than substitutes as for the single equation estimates. The systems estimates for fruits and vegetables differ from the single equation estimates on the signs of the cross elasticity for miscellaneous foods only. The systems estimates indicate that meat, poultry and fish is a price substitute for cereal and bakery products, in contradiction of the single equation estimates. Finally, the systems estimates indicate that miscellaneous food is a compensated price complement to eggs in contradiction of the single equation estimates. There are also differences in the magnitudes of the cross elasticities between the two estimators which the reader may discover by examination of

Table V.3. In summary these variations in sign and in magnitude indicate the inaccuracies which can result from not utilizing the extra information available in the data through the use of the systems estimation method.

Turning now to estimates of the system of demand equations including a demographic scale reported in Table V.2.3 it can be noted that slightly fewer of the estimated price coefficients are statistically different from zero than was the case for the systems estimator excluding the demographic scale. The demographic scale variables for number of family members and for city location are generally significantly different from zero. In contrast the scale variables for marriage, for tenure of the family home, and for employment, especially part-time employment, are less well estimated.

The calculated expenditure elasticities with respect to food at home expenditure and with respect to total expenditure, and the calculated own price elasticities are reported in Table 14. Again all foods are estimated to be "normal" and "necessary". The estimates vary slightly from those obtained from the system without a scale although the ordering of the foods by the relative magnitudes of their expenditure elasticities is preserved.

The own price elasticities are all estimated to be negative and in the inelastic range. The ordering of the foods by the magnitudes of their uncompensated own price elasticities is similar to the estimates from the system without a scale with the exception that cereal and bakery products have moved from being second most elastic to fourth most. In terms of the absolute magnitudes of the estimates the effect of the inclusion of the demographic scale has been to reduce the magnitudes of the own price elasticities for cereal and bakery products, for vegetables and fruits, for miscellaneous foods, and for eggs by a significant proportion, indicating that the scale variables are important determinants of consumers response to price changes of these commodities.

TABLE 14. EXPENDITURE AND OWN PRICE ELASTICITIES OF DEMAND: SEVEN FOOD DISAGGREGATION, SYSTEMS ESTIMATES INCLUDING DEMOGRAPHIC SCALE

Commodity	Food at Home Expenditure	Total Expenditure
Expenditure Elasticities of Demand		
Dairy	.6739	.1197
Cereal and Bakery Products	.8522	.1514
Fats and Oils	1.0985	.1952
Eggs	.8223	.1461
Vegetables and Fruits	1.0879	.1933
Meat, Poultry and Fish	1.2493	.2220
Miscellaneous	.8137	.1446

Commodity	Uncompensated	Compensated
Own Price Elasticities of Demand		
Dairy	-.6028	-.5037
Cereal and Bakery Products	-.3599	-.2647
Fats and Oils	-.5079	-.5448
Eggs	-.1257	-.1070
Vegetables and Fruits	-.2241	-.0336
Meat, Poultry and Fish	-.7300	-.3068
Miscellaneous	-.1484	-.0014

The income compensated elasticities reported in Table 14 show some variation from those estimated using the systems estimator without scale variables. The relative rankings of the four most elastic foods change. Fats and oils is estimated to be the most elastic food, dairy products second most elastic, meat, poultry, and fish third most elastic and cereal and bakery product is estimated to be fourth most elastic.

The full matrix of uncompensated elasticities with respect to expenditure, to own and cross price, and to changes in the socio-economic and demographic scale variables is reported in Table V.3 Section III while the matrix of expenditure compensated price elasticities is reported in Table V.4 Section III. The inclusion of the scale variables is seen to result in the compensated cross elasticities between (i) egg and cereal and bakery, (ii) vegetables and fruits, and cereal and bakery, (iii) miscellaneous foods and vegetables and fruits, becoming substitutes rather than complements as was estimated by the systems estimator without scale variables. In addition the (i) eggs and fats and oils, and the (ii) meat, poultry and fish, and fats and oils cross price signs become positive due to the inclusion of scale variables.

FOOTNOTES FOR SECTION IV

1. "Spending unit" is defined as a group of persons who live in the, same dwelling and are dependent on a common or pooled income for the major items of expense (inclusive of at least food and shelter).

2. Hassan, Z. and S.R. Johnson, "Family Expenditure Patterns in Canada", Economics Branch, Agriculture Canada, Publication No. 76/3, June 1976.

3. McIntosh, C.E., "Canadian Food Expenditures in 1980", Canadian Journal of Agricultural Economics, Vol. 22, Nov. 1974, pp. 45-51, reports a value of -0.26 using a linear expenditure system of estimating equations. Wales, T.J., "A Generalized Linear Expenditure Model of the Demand for Non Durable Goods in Canada," Canadian Journal of Economics, Vol. 4, Nov. 1971, pp. 471-484, reports values of -0.27 and -0.39 using static and quasi-dynamic forms of the linear expenditure system. Powell, A.A., "Post War Consumption in Canada: A First Look at Aggregation", Canadian Journal of Economics and Political Science, Vol. 31, Nov. 1965, pp. 559-565, reports on own price elasticity for food of -0.46. Hassan, Z. and Johnson, S.R., "Consumer Demand for Major Foods in Canada," Economics Branch Publication No. 76/2, Agriculture Canada, April 1976, calculates an own price elasticity for food in Canada of -0.29.

4. Hassan, op. cit. in Note 2, calculates the own price elasticity for non food to be -1.02. Goddard, D., "An Analysis of Canadian Aggregate Demand for Food at Home and Away from Home", Canadian Journal of Agricultural Economics, Vol. 31, Nov. 1983, p. 289-318, estimates the own price elasticity for non food·from time series data and obtains a value of -0.95 using a linear expenditure system and a value of -.91 using an AIDS.

5. Hassan, op.cit. in Note 2 calculates an income elasticity for food of 0.22. Wales, op.cit. in Note 3, estimates values of 0.31 and 0.86 using the static and quasi-dynamic forms of the linear expenditure system. McIntosh, op.cit. in Note 3, estimates an income elasticity for food of 0.45 using a linear expenditure system. Powell, op.cit. in Note 3, estimates an income elasticity of 0.58. Goddard, op.cit. in Note 4, estimates the elasticity of total current expenditure with respect to income to be 0.90 using the linear expenditure system or 0.93 using the AIDS. The estimated elasticities with respect to income may be adjusted to elasticities with respect to total expenditure by dividing by Goddard's estimate. Thus Hassan's estimated total expenditure, elasticity becomes .24, Wales 0.34 and 0.92 - 0.95, McIntosh's 0.45 - 0.48 and Powell's 0.62 - 0.64.

6. Goddard, op.cit., (Note 4), estimates the non food elasticity of total expenditure to be 1.10 using the linear expenditure system or 1.14 using the AIDS. Hassan calculates a non food elasticity of income of 1.24 which implies (Note 2) an elasticity of total expenditure of 1.33 to 1.38.

7. Elasticities reported in Table 6 are taken from Goddard, D., "An Analysis of Canadian Aggregate Consumer Demand for at Home and Food Away from Home," Canadian Journal of Agricultural Economics, Vol. 31. November 1983. pp. 289-318.

8. See Roberts, D. "The Impact of Rising Food Prices on Low Income Consumers", Publication No. 44, Marketing and Economics Branch, Agriculture Canada, 1982.

9. Thiel, H., Principles of Econometrics, John Wiley, New York, 1971, p. 396-397 has shown that the test statistic computed as -2*[log (likelihood function from restricted estimation) - log (Likelihood function from unrestricted estimation)] has a chi-squared distribution with degrees of freedom equal to the number of additional restrictions imposed on the restricted estimation.

10. Empirical studies (Barten, A, "Maximum Likelihood Estimation of a Complete System of Demand Equations", European Economic Review, Vol. 1, 1969, p. 7-73, Deaton, A. "The Analysis of Consumer Demand in the U.K., 1900-1970", Econometrica, Vol. 42, 1974, p. 341-67, Deaton, A and J. Muellbauer,, "An Almost Ideal Demand System", American Economic Review, Vol. 70, No. 3, 1980, p. 312-326) estimating systems of consumer demand equations and performing tests of homogeneity and symmetry have most often found homogeneity to be statistically rejected. Symmetry as an additional restriction has also, though less often been found inconsistent with the data. Experimental investigation of the properties of the commonly used test statistics, the Wold test, the Likelihood Ratio Test, and the Lagrange Multiplier test (Laitinen, K. "Why is Demand Homogeneity so Often Rejected?", Economics Letters, 1, 1978, p 187-191, and Meisner, J.F., 1979, "The Sad Fate of the Asymptotic Slutsky Symmetry Test for Large Systems" Economics Letters, 2, 1978, p. 231-233, Bewley, R.A, "Tests of Restrictions in Large Demand Systems", European Economic Review, Vol. 20, No. 13, January 1983, p. 257-269.) indicate that for small data samples these tests have a substantial degree of bias toward rejection of the hypotheses tested. However, the results presented by Bewley, (Table 1, p. 264) indicate that when the sample size is large relative to the number of equations plus the number of regressors per equation, that the degree of bias is small. When T = sample size - number of equations - number of regressors per equation is 50

and the number of equations is 2 the percentage of rejections by the different test statistics for a nominal 5% asymptotic test ranges between 4% and 6%, indicating a low degree of inaccuracy. The degree of inacurracy is seen to decrease as T increases holding the number of equations constant. For the tests of homogeneity and symmetry reported in the text the sample size is over 14,000 and the number of equations is two. Based on Bewley's results it may be concluded that the rejections of homogeneity and symmetry are not a result of the small sample biaseness of the Likelihood ratio test.

11. See Diewert, E., "Symmetry Conditions for Market Demand Functions", Review of Economic Studies, 47, 1980, p. 595-601. Jorgenson, D.W., L.J. Lau, and T.M. Stoker, "The Transcendental Logarithmic Model of Aggregate Consumer Behavior" in Advances in Econometrics, vol. 1, JAI Press, 1982, p. 97-238, and references cited therein.

12. Blanciaforti, L. and R. Green "The Almost Ideal Demand System: A Comparison and Application to Food Groups", Agricultural Economics Research, Vol. 35, No. 3, July 1983, p. 1-6.

V SUMMARY AND ISSUES FOR FURTHER STUDY

The study has analyzed Canadian consumer food demand at both aggregate and disaggregated commodity levels, and provides basic parameters characterizing Canadian consumer food demand which will be of assistance to food policy analysts.

The parameters characterizing the basic structure of consumer food demand can be utilized in three basic categories of analysis. Firstly, in themselves the parameters describe retail food demand amd are of interest for the enhanced understanding they provide concerning the fundamental structure of consumer's expenditure responses. In combination with historical data the parameters provide an explanation of the causes and changes in observed consumption.

Secondly the estimated models may be utilized as anticipatory planning aids to make projections of future consumption requirements under various anticipated price scenarios. This capability could be useful to supply management agencies in efficiently matching supply levels to consumer demand under varying market conditions, while maintaining price levels adequate to provide an equitable return to producers. This capability could also aid in identifying non-domestically required potentially exportable product surplus to domestic requirements, and in identifying domestic consumer demand in excess of domestic production which could indicate import substitution opportunities.

The third basic category of analysis in which the study's results could be applied is in policy evaluation. This may take the form of examination of the likely impact of a proposed program or may involve post-implementation evaluation of the effects and success of a program. Section V.3 provides an example of a post implementation assessment of program impacts.

The study has examined the allocation of Canadian consumer spending between food and non-food expenditure and between food at home, food expenditure in restaurants, and non-food expenditure and has investigated how the allocation decision is affected by socio-economic and demographic factors such as family size and composition, employment status of the household adults, educational attainment of the household head, and tenure of the family home. Complete matrices of demand elasticities for food and non-food and for food at home, food expenditure in restaurants and non-food expenditure were estimated and are reported. In addition the estimated system of equations for the three categories was statistically tested for conformity with the theoretical hypotheses of homogeneity of degree zero in prices and expenditure, and of symmetry of the matrix of expenditure compensated substitution terms.

The study has also estimated complete matrices of own and cross price, and expenditure elasticities for seven foods as single Almost Ideal Demand System equations, and as a system of AIDS equations using a seemingly unrelated equations systems estimator. The seven equation system was also estimated using a demographic equivalence scale to examine the effets of socio-economic and demographic characteristics on disaggregate food demand.

This is the first study to derive complete matrices of elasticities for aggregate and disaggregate commodity level consumer demands for food from the combination of multiple Urban Family Food Expenditure Surveys.

Several extensions of the study could be undertaken. One is to estimate the models using subsamples of the data stratified by income to provide a set of demand parameters specific to the low income segment of the population. These would be of considerable interest to economists and others involved in the analysis of the nutritional welfare of low income groups. A second extension would be to estimate the models using a modified functional form of the estimating equation and scaling variable which would allow subsequent analysis to be performed at much reduced cost using time series data,[1] and would provide estimated expenditure and price elasticities which are functions of the demographic and socio-economic variables.

Another extension involves improvement of the econometric methodology employed. The results compared estimates from OLS estimators and those from SUR estimators and found the systems estimators preferable. However the problems of the presence of observations of nil levels of purchase, and of potentially unequal variances between samples were not addressed. Employment of an estimator which accounted for these two concerns could significantly improve the estimates and allow the data to support a greater degree of disaggregation. The techniques for carrying out this extension are available although the cost in computing resources is likely to be not inconsiderable.

The consistency of the estimates from the multiple levels of the hypothesized budgeting procedure could be improved. The hypotheses of demand theory implies restriction on the elasticities between aggregate and disaggregate demand systems involving non linearity in the estimated parameters. These restrictions were not imposed in the estimations due to computational resource constraints. More significant extensions of the present research would involve utilization of a dynamic demand model either of the ad-hoc habit formation type or of the type which is consistent with the maximization of an intertemporal utility function.

FOOTNOTE FOR SECTION V

1. See Jorgensen, D.W., L.J. Lau, and T.M. Stoker, "The Transcendental Logarithmic Model of Aggregate Consumer Behavior", in Advances in Econometrics, Vol. 1, 1982, JAI Press, p. 97-238.

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APPENDIX - ENGEL FUNCTIONS

TABLE I.1. ENGEL FUNCTIONS BY YEAR

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
		- 1972 -		
Food At Home	1.3944	-0.1463	0.1088	0.5498
	(0.0196)*	(0.0023)	(0.0023)	
Food Away From Home	-0.1520	0.0238	-0.0228	0.0976
	(0.0116)	(0.0014)	(0.0014)	
Non Food	-0.2424	0.1224	-0.0860	0.4138
	(0.0213)	(0.0026)	(0.0025)	
Total Food	1.2424	-0.1224	0.0860	0.4138
	(0.0213)	(0.0026	(0.0025)	
		- 1974 -		
Food At Home	1.5439	-0.1589	0.1161	0.5267
	(0.0196)	(0.0023)	(0.0024)	
Food Away From Home	-0.1745	0.0261	-0.0259	0.1028
	(0.0109)	(0.0013)	(0.0013)	
Non Food	-0.3693	0.1328	-0.0902	0.4159
	(0.0204)	(0.0024)	(0.0025)	
Total Food	1.3693	-0.1328	0.0902	0.4159
	(0.0204)	(0.0024)	(0.0025)	
		- 1976 -		
Food At Home	1.3571	-0.1355	0.1075	0.5319
	(0.0196)	(0.0022)	(0.0022)	
Food Away From Home	-0.1727	0.0259	-0.0285	0.1038
	(0.0134)	(0.0015)	(0.0015)	
Non Food	-0.1842	0.1096	-0.0790	0.3699
	(0.0216)	(0.0024)	(0.0025)	
Total Food	1.1843	-0.1096	0.0790	0.3699
	(0.0216)	(0.0024)	(0.0025)	
		- 1978 -		
Food At Home	1.4205	-0.1398	0.1092	0.5106
	(0.0220)	(0.0025)	(0.0025)	
Food Away From Home	-0.2076	0.0293	-0.0229	0.1121
	(0.0143)	(0.0016)	(0.0016)	
Non Food	-0.2128	0.1104	-0.0802	0.3465
	(0.0241)	(0.0027)	(0.0028)	
Total Food	1.2129	-0.1104	0.0802	0.3465
	(0.0241)	(0.0027)	(0.0028)	

*Standard errors are in parentheses.

TABLE I.2. ENGEL FUNCTIONS BY INCOME STRATA, 1978

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
- First Quintile -				
Food At Home	1.8075	-0.1841	0.1316	0.3468
	(0.0800)*	(0.0097)	(0.0094)	
Food Away From Home	-0.1034	0.0145	-0.0057	0.0320
	(0.0317)	(0.0039)	(0.0037)	
Non Food	-0.7040	0.1695	-0.1259	0.3022
	(0.0810)	(0.0098)	(0.0095)	
Total Food	1.7040	-0.1695	0.1259	0.3022
	(0.0810)	(0.0098)	(0.0095)	
- Second Quintile -				
Food At Home	1.4411	-0.1427	0.1132	0.2405
	(0.0860)	(0.0101)	(0.0101)	
Food Away From Home	-0.1496	0.0218	-0.0192	0.0200
	(0.0513)	(0.0060)	(0.0060)	
Non Food	-0.2914	0.1209	-0.0940	0.1603
	(0.0942)	(0.0110)	(0.0111)	
Total Food	1.2914	-0.1209	0.0940	0.1603
	(0.0942)	(0.0110)	(0.0111)	
- Third Quintile -				
Food at Home	1.3153	-0.1292	0.1047	0.2664
	(0.0745)	(0.0085)	(0.0083)	
Food Away From Home	-0.0782	0.0135	-0.0080	0.0113
	(0.0476)	(0.0054)	(0.0053)	
Non Food	-0.2370	0.1157	-0.0967	0.1960
	(0.0814)	(0.0093)	(0.0091)	
Total Food	1.2370	-0.11577	0.0967	0.1960
	(0.0814)	(0.0093)	(0.0091)	
- Fourth Quintile -				
Food At Home	1.1806	-0.1151	0.1058	0.2816
	(0.0669)	(0.0074)	(0.0071)	
Food Away From Home	-0.0574	0.0139	-0.0262	0.0309
	(0.0613)	(0.0068)	(0.0065)	
Non Food	-0.1231	0.1011	-0.0796	0.1615
	(0.0815)	(0.0090)	(0.0087)	
Total Food	1.1232	-0.1011	0.0796	0.1615
	(0.0815)	(0.0090)	(0.0087)	
- Fifth Quintile -				
Food At Home	0.8618	-0.0800	0.0770	0.2822
	(0.0507)	(0.0054)	(0.0058)	
Food Away From Home	-0.0606	0.0017	-0.0185	0.0243
	(0.0528)	(0.0056)	(0.0060)	
Non Food	-0.0775	0.0783	-0.0584	0.1666
	(0.0665)	(0.0071)	(0.0076)	
Total Food	0.9224	-0.0783	0.0584	0.1666
	(0.0665)	(0.0071)	(0.0076)	

*Standard errors are in parentheses.

TABLE I.3. ENGEL FUNCTIONS BY FAMILY TYPE, 1978

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
	- Married Couples With No Children Under 16, - Head Under 65 Years			
Food At Home	1.3220 (0.0464)*	-0.1301 (0.0050)	0.1223 (0.0076)	0.4731
Food Away From Home	-0.1734 (0.0335)	0.0246 (0.0036)	-0.0152 (0.0055)	0.0547
Non Food	-0.1485 (0.0497)	0.1055 (0.0054)	-0.1071 (0.0082)	0.3461
Total Food	1.1485 (0.0497)	-0.1055 (0.0054)	0.1071 (0.0082)	0.3461
	- Married Couples with Children Under 16, - Head Under 65 Years			
Food At Home	1.3563 (0.0461)	-0.1362 (0.0048)	0.1266 (0.0070)	0.4751
Food Away From Home	-0.1759 (0.0232)	0.0235 (0.0024)	-0.0123 (0.0035)	0.0843
Non Food	-0.1803 (0.0505)	0.1127 (0.0053)	-0.1143 (0.0077)	0.3503
Total Food	1.1803 (0.0505)	-0.1127 (0.0053)	0.1143 (0.0077)	0.3503
	- Married Couples with Head 65 or Over -			
Food at Home	1.5835 (0.1016)	-0.1551 (0.0120)	0.9873 (0.0277)	0.4508
Food Away From Home	-0.2727 (0.0397)	0.0328 (0.0047)	-0.0001 (0.0108)	0.2245
Non Food	-0.3106 (0.1023)	0.1223 (0.0120)	-0.0985 (0.0279)	0.3290
Total Food	1.3107 (0.1023)	-0.1223 (0.0120)	0.0985 (0.0279)	0.3290
	- Unattached Individuals Under 65 Years -			
Food At Home	1.1098 (0.0545)	-0.1099 (0.0060)		0.4166
Food Away From Home	-0.1204 (0.0566)	0.0210 (0.0062)		0.0251
Non Food	0.0107 (0.0675)	0.0859 (0.0074)		0.2310
Total Food	0.9893 (0.0675)	-0.0859 (0.0074)		0.2310

(continued)

TABLE I.3. (Concluded)

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
- Unattached Individuals 65 Years or Over -				
Food At Home	1.4626	-0.1417		0.3217
	(0.1239)	(0.0147)		
Food Away From Home	-0.1423	0.0198		0.0267
	(0.0721)	(0.0086)		
Non Food	-0.3202	0.1219		0.2285
	(0.1349)	(0.0160)		
Total Food	1.3203	-0.1219		0.2285
	(0.1349)	(0.0160)		
- All Other Families -				
Food at Home	1.5572	-0.1553	0.1212	0.5321
	(0.0641)	(0.00709)	(0.0082)	
Food Away From Home	-0.1774	0.0257	-0.0216	0.0804
	(0.0389)	(0.0043)	(0.0050)	
Non Food	-0.3797	0.1296	-0.0996	0.3863
	(0.0718)	(0.0079)	(0.0092)	
Total Food	1.3798	-0.1296	0.0996	0.3863
	(0.0718)	(0.0079)	(0.0092)	
- Single, With Children Under 16 Years -				
Food At Home	1.4379	-0.1450	0.1211	0.4587
	(0.1526)	(0.0170)	(0.0281)	
Food Away From Home	-0.1849	0.0255	-0.0236	0.2225
	(0.0470)	(0.0052)	(0.0087)	
Non Food	-0.2529	0.1195	-0.0974	0.3418
	(0.1601)	(0.0179)	(0.0295)	
Total Food	1.2529	-0.1195	0.0974	0.3418
	(0.1601)	(0.0179)	(0.0295)	

*Standard errors are in parentheses.

TABLE I.4. ENGEL FUNCTIONS BY EMPLOYMENT STATUS, 1978

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
- Male Head Employed Fulltime and - Female Head Employed Fulltime				
Food At Home	1.1003 (0.0768)*	-0.1068 (0.0080)	0.1063 (0.0070)	0.4178
Food Away From Home	-0.0643 (0.0539)	0.0143 (0.0056)	-0.0240 (0.0049)	0.0538
Non Food	-0.0359 (0.0863)	0.0925 (0.0089)	-0.0823 (0.0079)	0.2740
Total Food	1.0359 (0.0863)	-0.0925 (0.0089)	0.0823 (0.0079)	0.2740
- Male Head Employed Fulltime and - Female Head Employed Part-Time				
Food At Home	1.1877 (0.0742)	-0.1168 (0.0079)	0.1063 (0.0072)	0.4142
Food Away From Home	-0.1172 (0.0477)	0.0210 (0.0051)	-0.0351 (0.0046)	0.1175
Non Food	-0.0704 (0.0831)	0.0958 (0.0088)	-0.0712 (0.0081)	0.2427
Total Food	1.0704 (0.0831)	-0.0958 (0.0088)	0.0712 (0.0081)	0.2427
- Male Head Employed Fulltime and - Female Head Not Employed				
Food at Home	1.3528 (0.0572)	-0.1310 (0.0061)	0.0959 (0.0065)	0.4392
Food Away From Home	-0.1332 (0.0339)	0.0195 (0.0036)	-0.0129 (0.0038)	0.0454
Non Food	-0.2195 (0.0642)	0.1115 (0.0069)	-0.0829 (0.0073)	0.3119
Total Food	1.2195 (0.0642)	-0.1115 (0.0069)	0.0829 (0.0073)	0.3119
- Male Head Employed Fulltime and - Female Head Employed FullTime				
Food At Home	1.3035 (0.1397)	-0.1311 (0.0148)	0.1414 (0.0141)	0.5467
Food Away From Home	-0.2068 (0.0989)	0.0281 (0.0105)	-0.0139 (0.0100)	0.0635
Non Food	-0.0967 (0.1553)	0.1029 (0.0165)	-0.1275 (0.0157)	0.4186
Total Food	1.0967 (0.1553)	-0.1029 (0.0165)	0.1275 (0.0157)	0.4186

(continued)

TABLE I.4. (Concluded)

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
- Male Head Not Employed and - Female Head Employed Fulltime				
Food At Home	1.6621 (0.4643)	-0.1620 (0.0491)	0.0895 (0.0458)	0.3478
Food Away From Home	-0.5397 (0.2555)	0.0546 (0.0270)	0.0570 (0.0252)	0.2963
Non Food	-0.1223 (0.5042)	0.1074 (0.0533)	-0.1465 (0.0497)	0.3139
Total Food	1.1223 (0.5042)	-0.1074 (0.0533)	0.1465 (0.0497)	0.3139
- Male Head Employed Part-Time and - Female Head Employed Part-Time -				
Food at Home	1.1155 (0.1193)	0.1082 (0.0126)	0.1066 (0.0131)	0.4253
Food Away From Home	-0.1424 (0.0746)	0.0233 (0.0079)	-0.0367 (0.0082)	0.1352
Non Food	0.0269 (0.1273)	0.0849 (0.0135)	-0.0699 (0.0139)	0.2566
Total Food	0.9730 (0.1273)	-0.0849 (0.0135)	0.0699 (0.0139)	0.2566
- Male Head Unemployed and - Female Head Unemployed				
Food At Home	1.6704 (0.1325)	-0.1655 (0.0153)	0.1111 (0.0234)	0.3767
Food Away From Home	-0.1544 (0.0390)	0.0194 (0.0045)	-0.0032 (0.0069)	0.0914
Non Food	-0.5159 (0.1297)	0.1460 (0.0150)	-0.1078 (0.0229)	0.3324
Total Food	1.5160 (0.1297)	-0.1460 (0.0150)	0.1078 (0.0299)	0.3324

*Standard errors are in parentheses.

TABLE I.5. ENGEL FUNCTIONS BY EDUCATIONAL ATTAINMENT OF HEAD OF HOUSEHOLD, 1978

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
		- Less Than Grade 9 -		
Food At Home	1.5018 (0.0570)*	0.1470 (0.0067)	0.1182 (0.0077)	0.4353
Food Away From Home	-0.2101 (0.0348)	0.0287 (0.0041)	-0.0246 (0.0047)	0.0732
Non Food	-0.2917 (0.0614)	0.1183 (0.0072)	-0.0936 (0.0083)	0.3004
Total Food	1.2917 (0.0614)	-0.1183 (0.0072)	0.0936 (0.0083)	0.3004
		- Partial Secondary -		
Food At Home	1.4521 (0.0479)	-0.1424 (0.0054)	0.1055 (0.0056)	0.4759
Food Away From Home	-0.1599 (0.0275)	0.0228 (0.0031)	-0.0164 (0.0032)	0.0655
Non Food	-0.2921 (0.0522)	0.1195 (0.0059)	-0.0891 (0.0061)	0.3505
Total Food	1.2922 (0.0522)	-0.1195 (0.0059)	0.0891 (0.0061)	0.3505
		- Complete Secondary -		
Food At Home	1.3229 (0.0507)	0.1300 (0.0056)	0.1085 (0.0053)	0.4663
Food Away From Home	-0.1841 (0.0352)	0.0271 (0.0039)	-0.0308 (0.0037)	0.0991
Non Food	-0.1387 (0.0573)	0.1028 (0.0063)	-0.0777 (0.0060)	0.2878
Total Food	1.1387 (0.0573)	-0.1028 (0.0063)	0.0777 (0.0060)	0.2878
		- Non University Post Secondary -		
Food At Home	1.1092 (0.0607)	-0.1072 (0.0066)	0.0956 (0.0055)	0.4355
Food Away From Home	-0.1430 (0.0442)	0.0226 (0.0048)	-0.0275 (0.0040)	0.0940
Non Food	0.0339 (0.0674)	0.0845 (0.0073)	-0.0680 (0.0061)	0.2585
Total Food	0.9661 (0.0674)	-0.0845 (0.0073)	0.0680 (0.0061)	0.2585

(continued)

TABLE I.5. (Concluded)

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
- Partial University -				
Food At Home	0.8474	-0.0793	0.0841	0.3458
	(0.0969)	(0.0105)	(0.0095)	
Food Away From Home	-0.0690	0.0160	-0.0371	0.1217
	(0.0794)	(0.0086)	(0.0078)	
Non Food	0.2216	0.0632	-0.0470	0.1595
	(0.1089)	(0.0118)	(0.0107)	
Total Food	0.7783	-0.0632	0.0470	0.1595
	(0.1089)	(0.0118)	(0.0107)	
- University Dregee -				
Food At Home	0.9220	-0.0874	0.0811	0.4140
	(0.0536)	(0.0057)	(0.0045)	
Food Away From Home	-0.1727	0.0266	-0.0340	0.1337
	(0.0457)	(0.0049)	(0.0038)	
Non Food	0.2506	0.0608	-0.0471	0.1528
	(0.0662)	(0.0071)	(0.0056)	
Total Food	0.7493	-0.0608	0.0471	0.1528
	(0.0662)	(0.0071)	(0.0056)	

*Standard errors are in parentheses.

TABLE I.6. ENGEL FUNCTIONS BY TENURE, 1978

Expenditure Share	Constant	Ln (Total Exp.)	Ln (Family Size)	R^2
		- Home owned Without Mortgage -		
Food At Home	1.5071	-0.1480	0.1182	0.4618
	(0.0546)*	(0.0063)	(0.0076)	
Food Away From Home	-0.1707	0.0232	-0.0091	0.0638
	(0.0337)	(0.0039)	(0.0047)	
Non Food	-0.3363	0.1248	-0.1090	0.3405
	(0.0595)	(0.0069)	(0.0083)	
Total Food	1.3364	-0.1248	0.1090	0.3405
	(0.0595)	(0.0069)	(0.0083)	
		- Home owned With Mortgage -		
Food At Home	1.1982	-0.1160	0.0970	0.4577
	(0.0434)	(0.0046)	(0.0041)	
Food Away From Home	-0.2029	0.0273	-0.0193	0.0972
	(0.0268)	(0.0028)	(0.0025)	
Non Food	0.0048	0.0887	-0.0776	0.2974
	(0.0479)	(0.0051)	(0.0045)	
Total Food	0.9952	-0.0887	0.0776	0.2974
	(0.0479)	(0.0051)	(0.0045)	
		- Tenant -		
Food At Home	1.3991	-0.1382	0.1117	0.5282
	(0.0339)	(0.0038)	(0.0038)	
Food Away From Home	-0.2441	0.0340	-0.0340	0.1549
	(0.0224)	(0.0025)	(0.0025)	
Non Food	-0.1549	0.1042	-0.0777	0.3370
	(0.0371)	(0.0041)	(0.0042)	
Total Food	1.1550	-0.1042	0.0777	0.3370
	(0.0371)	(0.0041)	(0.0042)	
		- Other Tenure -		
Food At Home	1.5250	-0.1500	0.0931	0.5698
	(0.0861)	(0.0097)	(0.0120)	
Food Away From Home	-0.1963	0.0294	-0.0423	0.1023
	(0.0693)	(0.0078)	(0.0096)	
Non Food	-0.3286	0.1206	-0.0508	0.4334
	(0.0954)	(0.0107)	(0.0133)	
Total Food	1.3287	-0.1206	0.0508	0.4334
	(0.0954)	(0.0107)	(0.0133)	

*Standard errors are in parentheses.

APPENDIX II - ENGEL FUNCTION ELASTICITIES

TABLE II.1 ENGEL FUNCTION ELASTICITIES BY YEAR

	1972	1974	1976	1978
		- Total Expenditure -		
Food at Home	0.1960	0.1580	0.2081	0.1872
Food Away from Home	1.6019	1.6398	1.5721	1.6151
Non-Food	1.1573	1.1724	1.1400	1.1416
Total Food	0.4473	0.4215	0.4937	0.4971
		- Family Size -		
Food at Home	0.5979	0.6155	0.6283	0.6352
Food Away from Home	-0.5761	-0.6351	-0.6290	-0.6077
Non-Food	-0.1105	-0.1171	-0.1009	-0.1029
Total Food	0.3881	0.3931	0.3650	0.3654

TABLE II.2 ENGEL FUNCTION ELASTICITIES BY INCOME STRATA, 1978

	1st	2nd	3rd	4th	5th
			- Total Expenditure -		
Food at Home	0.2867	0.3076	0.2398	0.2356	0.3133
Food Away from Home	1.5691	1.5963	1.3029	1.2549	1.0264
Non-Food	1.2368	1.1597	1.1474	1.1273	1.0958
Total Food	0.4025	0.5019	0.4606	0.5074	0.5699
			- Family Size -		
Food at Home	0.5097	0.5492	0.6158	0.7025	0.6604
Food Away from Home	-0.2225	-0.5246	-0.1794	-0.4782	-0.2827
Non-Food	-0.1758	-0.1241	-0.1231	-0.1002	-0.0715
Total Food	0.4436	0.3872	0.4506	0.3876	0.3210

TABLE II.3 ENGEL FUNCTION ELASTICITIES BY FAMILY TYPE 1978

	Total Expenditure	Family Size	Total Expenditure	Family Size
	Married Couples with no children under 16 years Head under 65 years		Married Couples with children under 16 years Head under 65 years	
Food at Home	0.1405	0.8079	0.2715	0.6770
Food Away from Home	1.4480	-0.2764	1.5942	-0.3104
Non-Food	1.1330	-0.1350	1.1458	-0.1478
Total Food	0.4889	0.5190	0.5028	0.5042
	Married Couples with Head 65 years or over		Unattached Individuals under 65 years	
Food at Home	0.2625	0.4693	0.0972	-
Food Away from Home	1.9150	-0.0045	1.2844	-
Non-Food	1.1623	-0.1307	1.1064	-
Total Food	0.5033	0.4002	0.5538	-
	Unattached Individuals 65 years and over		All other Families	
Food at Home	0.4029	-	0.1324	0.6773
Food Away from Home	1.6881	-	1.5399	-0.4553
Non-Food	1.1662	-	1.1677	-0.1288
Total Food	0.5419	-	0.4280	0.4394
	Single, with Children Under 16 years			
Food at Home	0.2757	0.6050		
Food Away from Home	1.8368	-0.7761		
Non-Food	1.1554	-0.1267		
Total Food	0.4819	0.4225		

TABLE II.4 ENGEL FUNCTION ELASTICITIES BY EMPLOYMENT STATUS, 1978

	Total Expenditure	Family Size	Total Expenditure	Family Size
	Male Head, Fulltime Female Head, Fulltime		Male Head, Fulltime Female Head, Part time	
Food at Home	0.2941	0.7026	0.2859	0.6502
Food Away from Home	1.2757	-0.4617	1.4493	-0.7508
Non-Food	1.1161	-0.1033	1.1213	-0.0902
Total Food	0.5453	0.4047	0.5446	0.3386
	Male Head, Fulltime Female Head, Not Employed		Male Head, Part time Female Head, Fulltime	
Food at Home	0.2968	0.5148	0.1962	0.8673
Food Away from Home	1.4602	-0.3058	1.5023	-0.2496
Non-Food	1.1446	-0.1076	1.1319	-0.1632
Total Food	0.5127	0.3625	0.5300	0.5818
	Male Head Not Employed Female Head Fulltime		Male Head part time Female Head part time	
Food at Home	0.1268	0.4822	0.3635	0.6274
Food Away from Home	2.4376	+1.4987	1.5151	-0.8109
Non-Food	1.1384	-0.1887	1.1082	-0.0891
Total Food	0.5197	0.6551	0.6055	0.3250
	Male Head, Not Employed Female Head, Not Employed			
Food at Home	0.3414	0.4421		
Food Away from Home	1.9565	-0.1619		
Non-Food	1.2006	-0.1480		
Total Food	0.4621	0.3969		

TABLE II.5 ENGEL FUNCTION ELASTICITIES BY EDUCATIONAL ATTAINMENT OF HEAD, 1978

	Total Expenditure	Family Size	Total Expenditure	Family Size
	less than grade 9		Partial Secondary	
Food at Home	0.3499	0.5224	0.2466	0.5584
Food Away from Home	1.7805	-0.6688	1.5303	-0.3827
Non-Food	1.1606	-0.1270	1.1557	-0.1160
Total Food	0.5499	0.3558	0.4845	0.3840
	Complete Secondary		Non University Post Secondary	
Food at Home	0.2288	0.6438	0.3130	0.6128
Food Away from Home	1.5698	-0.6466	1.4449	-0.5410
Non-Food	1.1313	-0.0992	1.1066	-0.0858
Total Food	0.5242	0.3595	0.5917	0.3287
	Partial University		University Degree	
Food at Home	0.4679	0.5642	0.3579	0.5956
Food Away from Home	1.3072	-0.7109	1.4667	-0.5958
Non-Food	1.0792	-0.0588	1.0754	-0.0583
Total Food	0.6856	0.2334	0.6955	0.2435

TABLE II.6 ENGEL FUNCTION ELASTICITIES BY TENURE, 1978

	Total Expenditure	Family Size	Total Expenditure	Family Size
	Home owned without mortgage		Home ownes with mortgage	
Food at Home	0.2705	0.5827	0.3042	0.5819
Food Away from Home	1.5331	-0.2112	1.6191	-0.4390
Non-Food	1.1657	-0.1447	1.1124	-0.0984
Total Food	0.4934	0.4425	0.5793	0.3683
	Regular Tenant		Other Tenure	
Food at Home	0.1725	0.6691	-0.0337	0.6415
Food Away from Home	1.6368	-0.6375	1.5668	-0.8156
Non-Food	1.1337	-0.0997	1.1502	-0.0632
Total Food	0.5271	0.3526	0.3877	0.2578

APPENDIX III - ALMOST IDEAL DEMAND SYSTEM OF EQUATIONS

TABLE III.1.A. TOTAL FOOD AND NON FOOD, ALL HOUSEHOLDS

Expenditure Share	Ln (Price of Food)	Ln (Price of Non Food)	Ln (Total Expenditure)	Ln (Family Size)
Food	0.1113 (0.0081)*	-0.1113 (0.0081)	-0.1194 (0.0012)	0.0837 (0.0013)
Non Food	-0.1113 (0.0081)	0.1113 (0.0081)	0.1194 (0.0012)	-0.0837 (0.0013)

TABLE III.1.B. FOOD AT HOME, FOOD AWAY FROM HOME AND NON FOOD, ALL HOUSEHOLDS

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
Food At Home	0.0864 (0.0089)	0.0052 (0.0054)	-0.0916 (0.0074)	-0.1461 (0.0012)	0.1103 (0.0012)
Food Away From Home	0.0052 (0.0054)	0.0165 (0.0052)	-0.0217 (0.0044)	0.0265 (0.0007)	-0.0264 (0.0007)
Non Food	-0.0916 (0.0074)	-0.0217 (0.0044)	0.1134 (0.0086)	0.1195 (0.0014)	0.0838 (0.0014)

*Standard errors are in parentheses.

TABLE III.2.A. TOTAL FOOD AND NON FOOD, BY INCOME STRATA

Expenditure Share	Ln (Price of Food)	Ln (Price of Non Food)	Ln (Total Expenditure)	Ln (Family Size)
		- First Quintile -		
Food	0.1553	-0.1553	-0.1806	0.1326
	(0.0197)*	(0.0197)	(0.0045)	(0.0042)
Non Food	-0.1553	0.1553	0.1806	-0.1326
	(0.0197)	(0.0197)	(0.0045)	(0.0042)
		- Second Quintile -		
Food	0.1451	-0.1451	-0.1400	0.1046
	(0.0179)	(0.0179)	(0.0048)	(0.0047)
Non Food	-0.1451	0.1451	0.1400	-0.1046
	(0.0179)	(0.0179)	(0.0048)	(0.0047)
		- Third Quintile -		
Food	0.0772	-0.0772	-0.1304	0.1032
	(0.0164)	(0.0164)	(0.0044)	(0.0042)
Non Food	-0.0772	0.0772	0.1304	-0.1032
	(0.0164)	(0.0164)	(0.0044)	(0.0042)
		- Fourth Quintile -		
Food	0.1130	-0.1130	-0.1193	0.0923
	(0.0169)	(0.0169)	(0.0044)	(0.0042)
Non Food	-0.1130	0.1130	0.1193	-0.0923
	(0.0169)	(0.0169)	(0.0044)	(0.0042)
		- Fifth Quintile -		
Food	0.0938	-0.0938	-0.0802	0.0558
	(0.0165)	(0.0165)	(0.0033)	(0.0034)
Non Food	-0.0938	0.0938	0.0802	-0.0558
	(0.0165)	(0.0165)	(0.0033)	(0.0034)

*Standard errors are in parentheses.

TABLE III.2.B. ALMOST IDEAL DEMAND SYSTEMS OF EQUATIONS - BY INCOME STRATA

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
- First Quintile -					
Food At Home	0.1387 (0.0221)*	0.0098 (0.0104)	-0.1486 (0.0193)	-0.1907 (0.0045)	0.1379 (0.0042)
Food Away From Home	0.0098 (0.0104)	-0.0082 (0.0095)	-0.0016 (0.0081)	0.0104 (0.0019)	-0.0056 (0.0018)
Non Food	-0.1486 (0.0193)	-0.0016 (0.0081)	0.1502 (0.0237)	0.1803 (0.0045)	-0.1323 (0.0039)
- Second Quintile -					
Food At Home	0.1216 (0.0195)	0.0006 (0.0110)	-0.1223 (0.0166)	-0.1576 (0.0045)	0.1184 (0.0044)
Food Away From Home	0.0006 (0.0110)	0.0256 (0.0103)	-0.0262 (0.0088)	0.0175 (0.0025)	-0.0137 (0.0024)
Non Food	-0.1223 (0.0166)	-0.0262 (0.0088)	0.1486 (0.0185)	0.1401 (0.0048)	-0.1047 (0.0027)
- Third Quintile -					
Food At Home	0.0549 (0.0179)	0.0032 (0.0109)	-0.0582 (0.0149)	-0.1455 (0.0041)	0.1171 (0.0039)
Food Away From Home	0.0032 (0.0109)	0.0182 (0.0107)	-0.0215 (0.0092)	0.0149 (0.0026)	-0.0136 (0.0025)
Non Food	-0.0582 (0.0149)	-0.0215 (0.0092)	0.0797 (0.0172)	0.1306 (0.0050)	-0.1035 (0.0027)
- Fourth Quintile -					
Food At Home	0.0207 (0.0180)	0.0269 (0.0119)	-0.0477 (0.0144)	-0.1312 (0.0038)	0.1128 (0.0036)
Food Away From Home	0.0269 (0.0119)	0.0459 (0.0121)	-0.0728 (0.0103)	0.0113 (0.0029)	-0.0196 (0.0028)
Non Food	-0.0477 (0.0144)	-0.0728 (0.0103)	0.1205 (0.0164)	0.1198 (0.0048)	-0.0931 (0.0028)
- Fifth Quintile -					
Food At Home	0.0545 (0.0169)	-0.0022 (0.0124)	-0.0522 (0.0127)	-0.0883 (0.0026)	0.0797 (0.0027)
Food Away From Home	-0.0022 (0.0124)	0.0459 (0.0140)	-0.0436 (0.0117)	0.0079 (0.0027)	-0.0236 (0.0028)
Non Food	-0.0522 (0.0127)	-0.0436 (0.0117)	0.0958 (0.0158)	0.0803 (0.0037)	-0.0560 (0.0028)

*Standard errors are in parentheses.

TABLE III.3.A. TOTAL FOOD AND NON FOOD - BY FAMILY TYPE

Expenditure Share	Ln (Price of Food)	Ln (Price of Non Food)	Ln (Total Expenditure)	Ln (Family Size)
	- Married Couples with no Children Under 16 - Head Under 65 Years			
Food	0.0938 (0.0143)*	-0.0938 (0.0143)	-0.1160 (0.0026)	0.1051 (0.0039)
Non Food	-0.0938 (0.0143)	0.0938 (0.0143)	0.1160 (0.0026)	-0.1051 (0.0039)
	- Married Couples with Children Under 16 - Head Under 65 Years			
Food	0.1194 (0.0115)	-0.1194 (0.0115)	-0.1180 (0.0023)	0.1146 (0.0031)
Non Food	-0.1194 (0.0115)	0.1194 (0.0115)	0.1180 (0.0023)	-0.1146 (0.0031)
	- Married Couples with Head 65 and Over -			
Food	0.0697 (0.0332)	-0.0697 (0.0332)	-0.1404 (0.0056)	0.1155 (0.0119)
Non Food	-0.0697 (0.0332)	0.0697 (0.0332)	0.1404 (0.0056)	-0.1155 (0.0119)
	- Unattached Individuals Under 65 Years -			
Food	0.0007 (0.0008)	-0.0007 (0.0008)	-0.0985 (0.0035)	- -
Non Food	-0.0007 (0.0008)	0.0007 (0.0008)	0.0985 (0.0035)	- -
	- Unattached Individuals 65 Years and Over -			
Food	-0.0022 (0.0014)	0.0022 (0.0014)	-0.1479 (0.0073)	- -
Non Food	0.0022 (0.0014)	-0.0022 (0.0014)	0.1479 (0.0073)	- -
	- All Other Families -			
Food	0.1370 (0.0260)	-0.1370 (0.0260)	-0.1297 (0.0037)	0.1013 (0.0044)
Non Food	-0.1370 (0.0260)	0.1370 (0.0260)	0.1297 (0.0037)	-0.1013 (0.0044)
	- Single, With Children Under 16 -			
Food	0.2175 (0.05620	-0.2175 (0.0562)	-0.1323 (0.0086)	0.1273 (0.0118)
Non Food	-0.2175 (0.0562)	0.2175 (0.0562)	0.1323 (0.0086)	-0.1273 (0.0118)

*Standard errors are in parentheses.

TABLE III.3.B FOOD AT HOME, FOOD AWAY FROM HOME, AND NON FOOD, BY FAMILY TYPE

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
	- Married Couples with no Children Under 16 - Head Under 65 Years				
Food At Home	0.0540 (0.0162)*	0.0122 (0.0103)	-0.0662 (0.0129)	-0.1398 (0.0024)	0.1241 (0.0035)
Food Away From Home	0.0122 (0.0103)	0.0167 (0.0101)	-0.0289 (0.0083)	0.0236 (0.0016)	-0.0188 (0.0024)
Non Food	-0.0662 (0.0129)	-0.0289 (0.0083)	0.0952 (0.0152)	0.1161 (0.0029)	-0.1053 (0.0043)
	- Maried Couples with Children Under 16 - Head Under 65 Years				
Food At Home	0.1036 (0.0119)	0.0013 (0.0064)	-0.1049 (0.0106)	-0.1376 (0.0022)	0.1269 (0.0029)
Food Away From Home	0.0013 (0.0064)	0.0143 (0.0061)	-0.0156 (0.0052)	0.0195 (0.0011)	-0.0122 (0.0014)
Non Food	-0.1049 (0.0106)	-0.0156 (0.0052)	0.1206 (0.0118)	0.1180 (0.0024)	-0.1146 (0.0032)
	- Married Couples with Head 65 and Over -				
Food At Home	0.0672 (0.0357)	-0.0038 (0.0172)	-0.0634 (0.0317)	-0.1644 (0.0054)	0.1167 (0.0115)
Food Away From Home	-0.0038 (0.0172)	0.0082 (0.0159)	-0.0043 (0.0136)	0.0239 (0.0023)	-0.0012 (0.0050)
Non Food	-0.0634 (0.0317)	-0.0043 (0.0136)	0.0677 (0.0345)	0.1404 (0.0059)	-0.1155 (0.0125)
	- Unattached Individuals Under 65 Years -				
Food At Home	0.0423 (0.0306)	0.0120 (0.0210)	-0.0543 (0.0227)	-0.1224 (0.0031)	
Food Away From Home	0.0120 (0.0210)	0.0418 (0.0218)	-0.0538 (0.0181)	0.0230 (0.0028)	
Non Food	-0.0543 (0.0227)	-0.0538 (0.0181)	0.1082 (0.0290)	0.0993 (0.0041)	
	- Unattached Individuals 65 Years and Over -				
Food At Home	0.1971 (0.0524)	-0.0493 (0.0313)	-0.1477 (0.0420)	-0.1583 (0.0070)	
Food Away From Home	-0.0493 (0.0313)	0.0275 (0.0295)	0.0218 (0.0237)	0.0105 (0.0041)	
Non Food	-0.1477 (0.0420)	0.0218 (0.0237)	0.1259 (0.0482)	0.1477 (0.0081)	

(continued)

TABLE III.3.B (Concluded)

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
			- All Other Families -		
Food At Home	0.0787 (0.0269)	0.0284 (0.0143)	-0.1071 (0.0238)	-0.1582 (0.0035)	0.1245 (0.0041)
Food Away From Home	0.0284 (0.0143)	0.0051 (0.0134)	-0.0335 (0.0129)	0.0283 (0.0020)	-0.0228 (0.0023)
Non Food	-0.1071 (0.0238)	-0.0335 (0.0129)	0.1406 (0.0270)	0.1298 (0.0040)	-0.1016 (0.0047)
			- Single, With Children Under 16 Years -		
Food At Home	0.1436 (0.0578)	0.0373 (0.0205)	-0.1809 (0.0544)	-0.1585 (0.0084)	0.1382 (0.0115)
Food Away From Home	0.0373 (0.0205)	-0.0235 (0.0173)	-0.0138 (0.0157)	0.0259 (0.0024)	-0.0111 (0.0033)
Non Food	-0.1809 (0.0544)	-0.0138 (0.0157)	0.1948 (0.0567)	0.1325 (0.0087)	-0.1270 (0.0012)

*Standard errors are in parentheses.

TABLE III.4.A. TOTAL FOOD AND NON FOOD - BY EMPLOYMENT STATUS

	Ln (Price of Food)	Ln (Price of Non Food)	Ln (Total Expenditure)	Ln (Family Size)
- Male Head and Female Head Employed Full Time -				
Food	0.0734	-0.0734	-0.1010	0.0750
	(0.0196)*	(0.0196)	(0.0036)	(0.0030)
Non Food	-0.0734	0.0734	0.1010	-0.0750
	(0.0196)	(0.0196)	(0.0036)	(0.0030)
- Male Head Employed Full Time and - Female Head Employed Part Time				
Food	0.0930	-0.0930	-0.1036	0.0815
	(0.0182)	(0.0182)	(0.0041)	(0.0037)
Non Food	-0.0930	0.0930	0.1036	-0.0815
	(0.0182)	(0.0182)	(0.0041)	(0.0037)
- Male Head Employed Full Time and - Female Head Not Employed Full-Time				
Food	0.0953	-0.0953	-0.1158	0.0742
	(0.0147)	(0.0147)	(0.0031)	(0.0033)
Non Food	-0.0953	0.0953	0.1158	-0.0742
	(0.0147)	(0.0147)	(0.0031)	(0.0033)
- Male Head Employed Part Time and - Female Head Employed Full Time				
Food	0.1240	-0.1240	-0.1074	0.1117
	(0.0416)	(0.0416)	(0.0086)	(0.0082)
Non Food	-0.1240	0.1240	0.1074	-0.1117
	(0.0416)	(0.0416)	(0.0086)	(0.0082)
- Male Head Not Employed and - Female Head Employed Full Time				
Food	0.1586	-0.1586	-0.1565	0.1156
	(0.0967)	(0.0967)	(0.0174)	(0.0220)
Non Food	-0.1586	0.1586	0.1565	-0.1156
	(0.0967)	(0.0967)	(0.0174)	(0.0220)
- Both Male and Female Head Employed Part-Time -				
Food	0.1790	-0.1790	-0.0997	0.0743
	(0.0374)	(0.0374)	(0.0056)	(0.0050)
Non Food	-0.1790	0.1790	0.0997	-0.0743
	(0.0374)	(0.0374)	(0.0056)	(0.0050)
- Neither Male nor Female Heads Employed -				
Food	0.1171	-0.1171	-0.1465	0.1216
	(0.0383)	(0.0383)	(0.0054)	(0.0062)
Non Food	-0.1171	0.1171	0.1465	-0.1216
	(0.0383)	(0.0383)	(0.0054)	(0.0062)

*Standard errors are in parentheses.

TABLE III.4.B. FOOD AT HOME, FOOD AWAY FROM HOME, AND NON FOOD - BY EMPLOYMENT STATUS

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
- Male Head and Female Head Employed Full Time -					
Food At Home	0.0733 (0.0202)*	-0.0180 (0.0128)	-0.0552 (0.0166)	-0.1173 (0.0031)	0.1045 (0.0026)
Food Away From Home	-0.0180 (0.0128)	0.0403 (0.0130)	-0.0222 (0.0119)	0.0162 (0.0025)	-0.0291 (0.0021)
Non Food	-0.0552 (0.0166)	-0.0222 (0.0119)	0.0774 (0.0204)	0.1011 (0.0040)	-0.0754 (0.0033)
- Male Head Employed Full Time and - Female Employed Part Time					
Food At Home	0.0359 (0.0190)	0.0271 (0.0116)	-0.0630 (0.0162)	-0.1232 (0.0037)	0.1039 (0.0033)
Food Away From Home	0.0271 (0.0116)	0.0073 (0.0115)	-0.0345 (0.0097)	0.0195 (0.0022)	-0.0220 (0.0020)
Non Food	-0.0630 (0.0162)	-0.0345 (0.0097)	0.0975 (0.0188)	0.1037 (0.0043)	-0.0819 (0.0039)
Male Head Employed Full Time and Female Head Not Employed -					
Food At Home	0.0873 (0.0155)	-0.0069 (0.0090)	-0.0804 (0.0133)	-0.1351 (0.0028)	0.0879 (0.0030)
Food Away From Home	-0.0069 (0.0090)	0.0235 (0.0085)	-0.0166 (0.0070)	0.0192 (0.0015)	-0.0136 (0.0016)
Non Food	-0.0804 (0.0133)	-0.0166 (0.0070)	0.0971 (0.0151)	0.1159 (0.0032)	-0.0742 (0.0034)
- Male Head Employed Part Time and - Female Head Employed Full-Time					
Food At Home	0.0402 (0.0418)	0.0383 (0.0247)	-0.0785 (0.0367)	-0.1293 (0.0078)	0.1339 (0.0074)
Food Away From Home	0.0383 (0.0247)	0.0147 (0.0249)	-0.0530 (0.0229)	0.0213 (0.0050)	-0.0214 (0.0048)
Non Food	-0.0785 (0.0367)	-0.0530 (0.0229)	0.1316 (0.0432)	0.1080 (0.0093)	-0.1124 (0.0088)
- Male Head Not Employed and - Female Head Employed Full time					
Food At Home	0.1262 (0.0933)	0.0169 (0.0473)	-0.1432 (0.0867)	-0.1661 (0.0161)	0.1020 (0.0204)
Food Away From Home	0.0169 (0.0473)	-0.0024 (0.0475)	-0.0144 (0.0463)	0.0097 (0.0083)	0.0140 (0.0106)
Non Food	-0.1432 (0.0867)	-0.0144 (0.0463)	0.1576 (0.0982)	0.1564 (0.0171)	-0.0880 (0.0216)

(continued)

TABLE III.4.B. (Concluded)

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
		- Both Male and Female Heads Employed Part-Time -			
Food At Home	0.0591 (0.0399)	0.0588 (0.0218)	-0.1180 (0.0342)	-0.1158 (0.0052)	0.1057 (0.0047)
Food Away From Home	0.0588 (0.0218)	0.0057 (0.0200)	-0.0646 (0.0193)	0.0161 (0.0032)	-0.0300 (0.0030)
Non Food	-0.1180 (0.0342)	-0.0646 (0.0193)	0.1826 (0.0039)	0.0997 (0.0061)	-0.0757 (0.0056)
		- Both Male and Female Head Not Employed -			
Food At Home	0.1483 (0.0409)	-0.0254 (0.0190)	-0.1228 (0.0364)	-0.1664 (0.0052)	0.1355 (0.0061)
Food Away From Home	-0.0254 (0.0190)	0.0134 (0.0163)	0.0120 (0.0169)	0.0200 (0.0026)	-0.0151 (0.0030)
Non Food	-0.1228 (0.0364)	0.0120 (0.0169)	0.1108 (0.0401)	0.1463 (0.0058)	-0.1204 (0.0068)

*Standard errors are in parentheses.

TABLE III.5.A. TOTAL FOOD AND NON FOOD - BY EDUCATIONAL ATTAINMENT OF HEAD

	Ln (Price of Food)	Ln (Price of Non Food)	Ln (Total Expenditure)	Ln (Family Size)
		- Less than Grade 96 -		
Food	0.1427	-0.1427	-0.1352	0.0974
	(0.0185)*	(0.0185)	(0.0031)	(0.0033)
Non Food	-0.1427	0.1427	0.1352	-0.0974
	(0.0185)	(0.0185)	(0.0031)	(0.0033)
		- Partial Secondary -		
Food	0.1231	-0.1231	-0.1174	0.0847
	(0.0159)	(0.0159)	(0.0027)	(0.0026)
Non Food	-0.1231	0.1231	0.1174	-0.0847
	(0.0159)	(0.0159)	(0.0027)	(0.0026)
		- Complete Secondary -		
Food	0.0872	-0.0872	-0.1039	0.0750
	(0.0161)	(0.0161)	(0.0028)	(0.0026)
Non Food	-0.0872	0.0872	0.1039	-0.0750
	(0.0161)	(0.0161)	(0.0028)	(0.0026)
		- Non University Post Secondary -		
Food	0.1291	-0.1291	-0.0926	0.0683
	(0.0217)	(0.0217)	(0.0038)	(0.0032)
Non Food	-0.1291	0.1291	0.0926	-0.0683
	(0.0217)	(0.0217)	(0.0038)	(0.0032)
		- Partial University -		
Food	0.1065	-0.1065	-0.0805	0.0679
	(0.0326)	(0.0326)	(0.0055)	(0.0051)
Non Food	-0.1065	0.1065	0.0805	-0.0679
	(0.0326)	(0.0326)	(0.0055)	(0.0051)
		- University Degree -		
Food	0.0530	-0.0530	-0.0738	0.0555
	(0.0190)	(0.0190)	(0.0033)	(0.0028)
Non Food	-0.0530	0.0530	0.0738	-0.0555
	(0.0190)	(0.0190)	(0.0033)	(0.0028)

*Standard errors are in parentheses.

TABLE III.5.8. FOOD AT HOME, FOOD AWAY FROM HOME AND NON FOOD, BY EDUCATIONAL ATTAINMENT OF HEAD

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
			- Less than Grade 9 -		
Food At Home	0.1469	-0.0083	-0.1385	-0.1593	0.1187
	(0.0219)*	(0.0126)	(0.0177)	(0.0030)	(0.0032)
Food Away From Home	-0.0083	0.0137	-0.0054	0.0243	-0.0215
	(0.0126)	(0.0114)	(0.0093)	(0.0017)	(0.0018)
Non Food	-0.1385	-0.0054	0.1439	0.1349	-0.0972
	(0.0177)	(0.0093)	(0.2000)	(0.0034)	(0.0037)
			- Partial Secondary -		
Food At Home	0.1199	-0.0181	-0.1017	-0.1425	0.1071
	(0.0175)	(0.0107)	(0.0144)	(0.0025)	(0.0024)
Food Away From Home	-0.0181	0.0403	-0.0221	0.0250	-0.0223
	(0.0107)	(0.0104)	(0.0085)	(0.0015)	(0.0015)
Non Food	-0.1017	-0.0221	0.1239	0.1175	-0.0848
	(0.0144)	(0.0085)	(0.1675)	(0.0029)	(0.0028)
			- Complete Secondary -		
Food At Home	0.0691	0.0013	-0.0705	-0.1283	0.1023
	(0.0175)	(0.0111)	(0.0143)	(0.0026)	(0.0024)
Food Away From Home	0.0013	0.0195	-0.0208	0.0243	-0.0272
	(0.0111)	(0.0111)	(0.0093)	(0.0017)	(0.0016)
Non Food	-0.0705	-0.0208	0.0913	0.1040	-0.0751
	(0.0143)	(0.0093)	(0.0171)	(0.0081)	(0.0029)
			- Non University Post Secondary -		
Food At Home	0.0672	0.0310	-0.0983	-0.1168	0.0982
	(0.0220)	(0.0137)	(0.0188)	(0.0034)	(0.0029)
Food Away From Home	0.0310	0.0024	-0.0335	0.0241	-0.0296
	(0.0137)	(0.0140)	(0.0127)	(0.0024)	(0.0020)
Non Food	-0.0983	-0.0335	0.1318	0.0927	-0.0685
	(0.0188)	(0.0127)	(0.0227)	(0.0041)	(0.0035)
			- Partial University -		
Food At Home	0.0693	0.0019	-0.0712	-0.0985	0.0912
	(0.0350)	(0.0228)	(0.0284)	(0.0049)	(0.0045)
Food Away From Home	0.0019	0.0435	-0.0455	0.0175	-0.0228
	(0.0228)	(0.0231)	(0.0197)	(0.0036)	(0.0033)
Non Food	-0.0712	-0.0455	0.1167	0.0809	-0.0684
	(0.0284)	(0.0197)	(0.0346)	(0.0061)	(0.0056)
			- University Degree -		
Food At Home	0.0031	0.0237	-0.0269	-0.0955	0.0847
	(0.0186)	(0.0121)	(0.0158)	(0.0027)	(0.0023)
Food Away From Home	0.0237	0.0063	-0.0301	0.0218	-0.0289
	(0.0121)	(0.0125)	(0.0114)	(0.0021)	(0.0018)
Non Food	-0.0269	-0.0301	0.0571	0.0737	-0.0557
	(0.0158)	(0.0114)	(0.0194)	(0.0034)	(0.0030)

*Standard errors are in parentheses.

TABLE III.6.A. TOTAL FOOD AND NON FOOD - BY TENURE OF DWELLING

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
		- Home owned Without Mortgage -			
Food	0.1110 (0.0197)*	-0.1110 (0.0197)		-0.1331 (0.0030)	0.1036 (0.0035)
Non Food	-0.1110 (0.0197)	0.1110 (0.0197)		0.1331 (0.0030)	-0.1036 (0.0035)
		- Home owned With Mortgage -			
Food	0.0719 (0.0124)	-0.0719 (0.0124)		-0.0964 (0.0024)	0.0744 (0.0022)
Non Food	-0.0719 (0.0124)	0.0719 (0.0124)		0.0964 (0.0024)	-0.0744 (0.0022)
		- Tenant -			
Food	0.1292 (0.0121)	-0.1292 (0.0121)		-0.1116 (0.0019)	0.0839 (0.0018)
Non Food	-0.1292 (0.0121)	0.1292 (0.0121)		0.1116 (0.0019)	-0.0839 (0.0018)
		- Other Tenure -			
Food	0.1237 (0.0396)	-0.1237 (0.0396)		-0.1454 (0.0051)	0.0798 (0.0062)
Non Food	-0.1237 (0.0396)	0.1237 (0.0396)		0.1454 (0.0051)	-0.0798 (0.0062)

*Standard errors are in parentheses.

TABLE III.6.B. FOOD AT HOME, FOOD AWAY FROM HOME, AND NON FOOD - BY TENURE

Expenditure Share	Ln (Price of Food at Home)	Ln (Price of Food Away From Home)	Ln (Price of Non Food)	Ln (Total Expend.)	Ln (Family Size)
- Home owned Without Mortgage -					
Food At Home	0.0997	-0.0019	-0.0977	-0.1552	0.1151
	(0.0206)*	(0.0111)	(0.0183)	(0.0029)	(0.0033)
Food Away From Home	-0.0019	0.0155	-0.0136	0.0220	-0.0114
	(0.0111)	(0.0112)	(0.0097)	(0.0015)	(0.0017)
Non Food	-0.0977	-0.0136	0.1114	0.1331	-0.1037
	(0.0183)	(0.0097)	(0.0202)	(0.0030)	(0.0035)
- Home owned With Mortgage -					
Food At Home	0.0490	0.0057	-0.0547	-0.1200	0.0912
	(0.0126)	(0.0073)	(0.0111)	(0.0022)	(0.0020)
Food Away From Home	0.0057	0.0144	-0.0201	0.0234	-0.0167
	(0.0073)	(0.0073)	(0.0064)	(0.0013)	(0.0012)
Non Food	-0.0547	-0.0201	0.0749	0.0965	-0.0745
	(0.0111)	(0.0064)	(0.0128)	(0.0025)	(0.0023)
- Tenant -					
Food At Home	0.0805	0.0204	-0.1010	-0.1464	0.1139
	(0.0142)	(0.0086)	(0.0112)	(0.0017)	(0.0017)
Food Away From Home	0.0204	0.0114	-0.0319	0.0348	-0.0299
	(0.0086)	(0.0079)	(0.0065)	(0.0011)	(0.0011)
Non Food	-0.1010	-0.0319	0.1329	0.1116	-0.0839
	(0.0112)	(0.0065)	(0.0129)	(0.0020)	(0.0020)
- Other Tenure -					
Food At Home	0.0666	0.0325	-0.0991	-0.1556	0.1188
	(0.0482)	(0.0329)	(0.0361)	(0.0048)	(0.0058)
Food Away From Home	0.0325	0.0013	-0.0338	0.0100	-0.0388
	(0.0329)	(0.0336)	(0.0261)	(0.0037)	(0.0045)
Non Food	-0.0991	-0.0338	0.1330	0.1456	-0.0800
	(0.0361)	(0.0261)	(0.0445)	(0.0061)	(0.0074)

*Standard errors are in parentheses.

APPENDIX IV - ALMOST IDEAL DEMAND SYSTEM ELASTICITIES

TABLE IV.1.A. ELASTICITY MATRIX, ALL HOUSEHOLDS

	Price			
	Food	Non-Food	Total Expenditure	Family Size
Food	-0.3454	-0.1151	0.4609	0.3780
Non-Food	-0.1863	-0.9672	1.1535	-0.1076

TABLE IV.1.B. ELASTICITY MATRIX, ALL HOUSEHOLDS

	Price				
	Food at Home	Food Away from Home	Non-Food	Total Expenditure	Family Size
Food at Home	-0.3156	0.0631	0.0748	0.1777	0.6210
Food Away from Home	-0.0266	-0.6485	-0.9299	1.6050	-0.6024
Non-Food	-0.1547	-0.0342	-0.9645	1.1536	-0.1077

TABLE IV.2.A. ELASTICITY MATRIX, BY INCOME STRATA

	Price			
	Food	Non-Food	Total Expenditure	Family Size
		- First Income Quintile -		
Food	-0.2832	-0.0894	0.3727	0.4607
Non-Food	-0.2899	-0.9638	1.2537	-0.1863
		- Second Income Quintile -		
Food	-0.2329	-0.1850	0.4182	0.4343
Non-Food	-0.2433	-0.9413	1.1845	-0.1377
		- Third Income Quintile -		
Food	-0.4799	0.0752	0.4051	0.4707
Non-Food	-0.1461	-1.0211	1.1671	-0.1322
		- Fourth Income Quintile -		
Food	-0.2818	-0.1336	0.4156	0.4523
Non-Food	-0.1842	-0.9657	1.1499	-0.1160
		- Fifth Income Quintile -		
Food	-0.3550	-0.2002	0.5557	0.3091
Non-Food	-0.1421	-0.9558	1.0979	-0.0681

TABLE IV.2.B. ELASTICITY MATRIX, BY INCOME STRATA

	Price			Total Expenditure	Family Size
	Food at Home	Food Away from Home	Non-Food		
			- First Income Quintile -		
Food at Home	-0.2989	0.0670	-0.0446	0.2762	0.5235
Food Away from Home	0.3003	-1.3542	-0.3720	1.4261	-0.2293
Non-Food	-0.2698	-0.0126	-0.9707	1.2533	-0.1859
			- Second Income Quintile -		
Food at Home	-0.2289	0.0344	-0.0439	0.2383	0.5721
Food Away from Home	-0.1054	-0.2629	-1.1514	1.5199	-0.4063
Non-Food	-0.2055	-0.0422	-0.9367	1.1846	-0.1379
			- Third Income Quintile -		
Food at Home	-0.4943	0.0519	0.2610	0.1813	0.6589
Food Away from Home	-0.0072	-0.5754	-0.7762	1.3589	-0.3290
Non-Food	-0.1147	-0.0344	-1.0182	1.1674	-0.1326
			- Fourth Income Quintile -		
Food at Home	-0.6606	0.2097	0.3026	0.1483	0.7320
Food Away from Home	0.4839	-0.0915	-1.6199	1.2274	-0.3932
Non-Food	-0.0961	-0.0977	-0.9567	1.1506	-0.1170
			- Fifth Income Quintile -		
Food at Home	-0.3624	0.0112	0.0953	0.2562	0.6713
Food Away from Home	-0.0677	-0.2623	-0.7983	1.1284	-0.3829
Non-Food	-0.0872	-0.0573	-0.9535	1.0981	-0.0683

TABLE IV.3.A. ELASTICITY MATRIX, BY FAMILY TYPE

	Price		Total Expenditure	Family Size
	Food	Non-Food		
- Married Couples, no children under 16 - and Head Under 65 Years				
Food	-0.3873	-0.0505	0.4382	0.5090
Non-Food	-0.1595	-0.9868	1.1463	-0.1325
- Married Couples with Children under 16 - and Head under 65 Years				
Food	-0.3281	-0.1522	0.4806	0.5044
Non-Food	-0.1975	-0.9552	1.1527	-0.1483
- Married Couples with Head 65 and Over -				
Food	-0.5749	0.1208	0.4545	0.4487
Non-Food	-0.1474	-1.0419	1.1892	-0.1555
- Unattached Individuals Under 65 Years -				
Food	-1.3886	-0.1683	0.4975	-
Non-Food	0.0947	-0.9589	1.1236	-
- Unattached Individuals 65 Years and Over -				
Food	-0.4203	-0.0684	0.4892	-
Non-Food	-0.2362	-0.9720	1.2081	-
- All Other Families -				
Food	-0.2309	-0.1947	0.4259	0.4482
Non-Food	-0.2245	-0.9431	1.1676	-0.1308
- Unattached Individuals with Children under 16 Years -				
Food	0.0292	-0.4949	0.4660	0.5138
Non-Food	-0.3392	-0.8368	1.1760	-0.1693

TABLE IV.3.B. ELASTICITY MATRIX, BY FAMILY TYPE

	Price				
	Food at Home	Food Away from Home	Non-Food	Total Expenditure	Family Size
		- Married Couples, no children under 16 - and Head Under 65 Years			
Food at Home	-0.4372	0.1153	0.2200	0.1019	0.7976
Food Away from Home	0.1281	-0.6897	-0.9028	1.4644	-0.3702
Non-Food	-0.1186	-0.0425	-0.9852	1.1464	-0.1327
		- Married Couples with Children under 16 - and Head under 65 Years			
Food at Home	-0.2817	0.0363	-0.0316	0.2768	0.6668
Food Away from Home	-0.0915	-0.6329	-0.8053	1.5299	-0.3330
Non-Food	-0.1725	-0.0264	-0.9537	1.1527	-0.1483
		- Married Couples with Head 65 and Over -			
Food at Home	-0.5286	0.0126	0.2412	0.2748	0.5149
Food Away from Home	-0.3140	-0.7643	-0.7032	1.7815	-0.0408
Non-Food	-0.1309	-0.0136	-1.0446	1.1892	-0.1555
		- Unattached Individuals Under 65 Years -			
Food at Home	-0.4256	0.1363	0.2677	0.0218	-
Food Away from Home	0.0908	-0.4228	-0.9931	1.3252	-
Non-Food	-0.0974	-0.0721	-0.9540	1.1236	-
		- Unattached Individuals 65 Years and Over -			
Food at Home	-0.1105	-0.1620	-0.1285	0.4013	-
Food Away from Home	-2.0742	0.0827	0.5681	1.4231	-
Non-Food	-0.2580	0.0221	-0.9721	1.2080	-
		- All Other Families -			
Food at Home	-0.3478	0.1949	0.0352	0.1173	0.6945
Food Away from Home	0.4617	-0.9156	-1.1530	1.6071	-0.4897
Non-Food	-0.1789	-0.0502	-0.9385	1.1678	-0.1313
		- Unattached Individuals with Children under 16 Years -			
Food at Home	-0.1760	0.1988	-0.3050	0.2821	0.6259
Food Away from Home	1.1480	-1.9080	-1.1977	1.9578	-0.4130
Non-Food	-0.2832	-0.0256	-0.8673	1.1762	-0.1688

TABLE IV.4.A. ELASTICITY MATRIX, BY EMPLOYMENT STATUS

	Price			
	Food	Non-Food	Total Expenditure	Family Size
- Male and Female Heads Employed Full Time -				
Food	-0.4952	-0.0039	0.4996	0.3715
Non-Food	-0.1278	-0.9990	1.1267	-0.0940
- Male Head Employed Full Time; - Female Head Employed Part Time				
Food	-0.4216	-0.0873	0.5095	0.3858
Non-Food	-0.1549	-0.9765	1.1314	-0.1033
- Male Head Employed Full Time & Female Head Not Employed -				
Food	-0.4444	-0.0524	0.4969	0.3222
Non-Food	-0.1662	-0.9843	1.1505	-0.0964
- Male Head Employed Part Time and - Female Head Employed Full Time				
Food	-0.2700	-0.2218	0.4923	0.5283
Non-Food	-0.1959	-0.9404	1.1363	-0.1417
- Male Head Not Employed & Female Head Employed Full Time -				
Food	-0.1029	-0.2048	0.3082	0.5110
Non-Food	-0.2624	-0.9400	1.2024	-0.1495
- Both Male and Female Heads Employed Part-Time -				
Food	-0.0247	-0.5053	0.5304	0.3501
Non-Food	-0.2631	-0.8636	1.1267	-0.0944
- Neither Male nor Female Head Employed -				
Food	-0.4160	-0.0442	0.4604	0.4477
Non-Food	-0.2176	-0.9835	1.2012	-0.1669

TABLE IV.4.B. ELASTICITY MATRIX, BY EMPLOYMENT STATUS

	Price				
	Food at Home	Food Away from Home	Non-Food	Total Expenditure	Family Size
	- Male and Female Heads Employed Full Time -				
Food at Home	-0.3170	-0.0890	0.1964	0.2098	0.7040
Food Away from Home	-0.4105	-0.2593	-0.6332	1.3030	-0.5446
Non-Food	-0.0995	-0.0330	-0.9940	1.1267	-0.0945
	- Male Head Employed Full Time and - Female Head Employed Part Time				
Food at Home	-0.6113	0.1910	0.1520	0.2686	0.6166
Food Away from Home	0.5255	-0.8472	-1.1343	1.4558	-0.5145
Non-Food	-0.1115	-0.0491	-0.9709	1.1316	-0.1038
	- Male Head Employed Full Time & Female Head Not Employed -				
Food at Home	-0.3744	-0.0072	0.0870	0.2943	0.4590
Food Away from Home	-0.2967	-0.4140	-0.7849	1.4960	-0.3517
Non-Food	-0.1406	-0.0277	-0.9821	1.1506	-0.0964
	- Male Head Employed Part Time and - Female Head Employed Full Time				
Food at Home	-0.5616	0.2675	0.0874	0.2068	0.8212
Food Away from Home	0.6839	-0.7149	-1.4082	1.4391	-0.4415
Non-Food	-0.1327	-0.0728	-0.9314	1.1370	-0.1426
	- Male Head Not Employed & Female Head Employed Full Time -				
Food at Home	-0.1412	0.1220	-0.1241	0.1432	0.5260
Food Away from Home	0.4501	-1.0881	-0.6616	1.2996	0.4330
Non-Food	-0.2341	-0.0269	-0.9411	1.2023	-0.1500
	- Both Male and Female Heads Employed Part-Time -				
Food at Home	-0.4887	0.3744	-0.2046	0.3187	0.6217
Food Away from Home	1.2985	-0.8793	-1.8006	1.3815	-0.7093
Non-Food	-0.1802	-0.0873	-0.8589	1.1266	-0.0961
	- Neither Male nor Female Head Employed -				
Food at Home	-0.2316	-0.0756	-0.0141	0.3208	0.5533
Food Away from Home	-1.1410	-0.5264	-0.0888	1.7568	-0.5720
Non-Food	-0.2169	0.0081	-0.9920	1.2009	-0.1652

TABLE IV.5.A. ELASTICITY MATRIX, BY EDUCATIONAL ATTAINMENT OF HEAD

	Price			
	Food	Non-Food	Total Expenditure	Family Size
		- Less than Grade 9 -		
Food	-0.3214	-0.1712	0.4927	0.3653
Non-Food	-0.2466	-0.9377	1.1844	-0.1328
		- Partial Secondary -		
Food	-0.3321	-0.1651	0.4977	0.3622
Non-Food	-0.2039	-0.9495	1.1533	-0.1105
		- Complete Secondary -		
Food	-0.4529	-0.0590	0.5122	0.3522
Non-Food	-0.1481	-0.9840	1.1320	-0.0953
		- Non University Post Secondary -		
Food	-0.2509	-0.3022	0.5534	0.3292
Non-Food	-0.1961	-0.9208	1.1169	-0.0862
		- Partial University -		
Food	-0.3474	-0.2458	0.5936	0.3426
Non-Food	-0.1613	-0.9392	1.1005	-0.0847
		- University Degree -		
Food	-0.6117	0.0002	0.6118	0.2923
Non-Food	-0.0911	-1.0001	1.0911	-0.0686

TABLE IV.5.B. ELASTICITY MATRIX, BY EDUCATIONAL ATTAINMENT OF HEAD

	Price			Total Expenditure	Family Size
	Food at Home	Food Away from Home	Non-Food		
- Less than Grade 9 -					
Food at Home	-0.2044	-0.0078	-0.1036	0.3153	0.5100
Food Away from Home	-0.4201	-0.6221	-0.6772	1.7201	-0.6352
Non-Food	-0.2330	-0.0149	-0.9358	1.1840	-0.1325
- Partial Secondary -					
Food at Home	-0.1978	-0.0641	0.0036	0.2585	0.5573
Food Away from Home	-0.5802	-0.0566	-0.9640	1.6007	-0.5358
Non-Food	-0.1697	-0.0352	-0.9484	1.1534	-0.1107
- Complete Secondary -					
Food at Home	-0.4058	0.0391	0.1289	0.2377	0.6080
Food Away from Home	-0.1010	-0.5856	-0.8580	1.5447	-0.6087
Non-Food	-0.1213	-0.0319	-0.9788	1.1322	-0.0955
- Non University Post Secondary -					
Food at Home	-0.4060	0.2231	-0.0904	0.2734	0.6109
Food Away from Home	0.5400	-0.9687	-1.0869	1.5155	-0.6350
Non-Food	-0.1523	-0.0471	-0.9175	1.1170	-0.0864
- Partial University -					
Food at Home	-0.3703	0.0405	-0.0035	0.3333	0.6176
Food Away from Home	-0.0449	-0.1511	-1.1522	1.3482	-0.4527
Non-Food	-0.1132	-0.0608	-0.9268	1.1010	-0.0853
- University Degree -					
Food at Home	-0.8108	0.2000	0.3015	0.3095	0.6119
Food Away from Home	0.3583	-0.8943	-0.8859	1.4217	-0.5601
Non-Food	-0.0552	-0.0409	-0.9949	1.0911	-0.0688

TABLE IV.6.A. ELASTICITY MATRIX, BY TENURE OF DWELLING

	Price			
	Food	Non-Food	Total Expenditure	Family Size
- Home owned Without Mortgage -				
Food	-0.3973	-0.0625	0.4603	0.4202
Non-Food	-0.1973	-0.9795	1.1767	-0.1375
- Home owned with Mortgage -				
Food	-0.5317	-0.0120	0.5442	0.3515
Non-Food	-0.1257	-0.9967	1.1224	-0.0943
- Tenant -				
Food	-0.2772	-0.2208	0.4981	0.3773
Non-Food	-0.2067	-0.9368	1.1435	-0.1079
- Other Tenure Types -				
Food	-0.2112	-0.0919	0.3037	0.3821
Non-Food	-0.2082	-0.9757	1.1838	-0.1008

TABLE IV.6.B. ELASTICITY MATRIX, BY TENURE OF DWELLING

	Price				
	Food at Home	Food Away from Home	Non-Food	Total Expenditure	Family Size
- Home owned Without Mortgage -					
Food at Home	-0.3412	0.0210	0.0659	0.2544	0.5532
Food Away from Home	-0.1884	-0.6181	-0.7668	1.5734	-0.2965
Non-Food	-0.1724	-0.0253	-0.9790	1.1767	-0.1377
- Home owned with Mortgage -					
Food at Home	-0.5446	0.0620	0.1844	0.2984	0.5333
Food Away from Home	0.0019	-0.6670	-0.9136	1.5786	-0.4134
Non-Food	-0.0989	-0.0305	-0.9930	1.1225	-0.0944
- Tenant -					
Food at Home	-0.3310	0.1531	0.0240	0.1535	0.6586
Food Away from Home	0.2448	-0.7971	-1.1530	1.7056	-0.6075
Non-Food	-0.1643	-0.0469	-0.9321	1.1436	-0.1079
- Other Tenure Types -					
Food at Home	-0.3532	0.2416	0.0790	0.0328	0.7381
Food Away from Home	0.6290	-0.9806	-0.8589	1.2105	-0.8108
Non-Food	-0.1696	-0.0503	-0.9641	1.1840	-0.1011

APPENDIX V SEVEN FOOD DISAGGREGATION

V.1 ENGEL FUNCTIONS

TABLE V.1.1. ENGEL FUNCTIONS, SEVEN COMMODITIES, 1974

Food	Intercept	Coefficients of Food at Home Expenditure
Dairy Products	.2779 (.0061)*	-0.0394 (.0018)
Cereal and Bakery	.1634 (.0048)	-0.0147 (.0014)
Fats and Oils	.0104 (.0019)	0.0040 (.0006)
Eggs	.0395 (.0020)	-0.0038 (.0006)
Vegetables and Fruits	.1781 (.0059)	-0.0026 (.0018)
Meat, Poultry and Fish	.1016 (.0096)	-0.0694 (.0029)
Miscellaneous	.2289 (.0070)	-0.0128 (.0021)

*Standard errors are in parentheses.

TABLE V.1.2. ENGEL FUNCTIONS; SEVEN FOOD COMMODITIES, 1976

Food	Intercept	Coefficients of Food at Home Expenditure
Dairy Products	.2830 (.0073)*	-0.0340 (.0021)
Cereal and Bakery	.1567 (.0050)	-0.0115 (.0014)
Fats and Oils	.0187 (.0021)	0.0013 (.0006)
Eggs	.0326 (.0019)	-0.0023 (.0005)
Vegetables and Fruits	.1688 (.0065)	0.0027 (.0019)
Meat, Poultry and Fish	.0932 (.0100)	0.0627 (.0029)
Miscellaneous	.1616 (.0073)	0.0055 (.0021)

*Standard errors are in parentheses.

TABLE V.1.3. ENGEL FUNCTIONS; SEVEN FOOD COMMODITIES, 1978

Food	Intercept	Coefficients of Food at Home Expenditure
Dairy Products	.2552	-0.0262
	(.0071)*	(.0020)
Cereal and Bakery	.1099	0.0006
	(.0047)	(.0013)
Fats and Oils	.0143	0.0025
	(.0020)	(.0005)
Eggs	.0297	-0.0023
	(.0019)	(.0054)
Vegetables and Fruits	.1514	0.0100
	(.0069)	(.0019)
Meat, Poultry and Fish	.0739	0.0641
	(.0092)	(.0026)
Miscellaneous	.1593	0.0077
	(.0076)	(.0021)

*Standard Errors in Parentheses.

V.2 DEMAND EQUATION ESTIMATES

TABLE V.2.1. SINGLE EQUATION: SEVEN FOOD COMMODITIES

Variable		Coefficient	Standard Error
Demand for Dairy Products			
Food at Home Expenditure		-.0316	.0011
Price of:	Dairy	.0118	.0180
	Cereal and Bakery	.1006	.1918
	Fats and Oils	-.0212	.0140
	Eggs	-.0134	.0085
	Vegetables and Fruits	-.0432	.0126
	Meat, Poultry and Fish	-.0494	.0145
	Miscellaneous	.0149	.0212
Intercept		.2612	.0057
Demand for Cereal and Bakery			
Food at Home Expenditure		-.0080	.0008
Price of:	Dairy	.0108	.0128
	Cereal and Bakery	.0363	.0136
	Fats and Oils	.0189	.0099
	Eggs	-.0062	.0060
	Vegetables and Fruits	-.0381	.0089
	Meat, Poultry and Fish	.0078	.0103
	Miscellaneous	-.0295	.0150
Intercept		.1357	.0040
Demand for Fats and Oils			
Food at Home Expenditure		.0242	.0003
Price of:	Dairy	.0193	.0053
	Cereal and Bakery	-.0180	.0057
	Fats and Oils	.0193	.0041
	Eggs	-.0041	.0025
	Vegetables and Fruits	-.0070	.0037
	Meat, Poultry and Fish	-.0014	.0043
	Miscellaneous	-.0080	.0063
Intercept		.0175	.0017
Demand for Eggs			
Food at Home Expenditure		-.0029	.0003
Price of:	Dairy	.0029	.0051
	Cereal and Bakery	.0111	.0054
	Fats and Oils	.0063	.0039
	Eggs	.0130	.0024
	Vegetables and Fruits	-.0015	.0036
	Meat, Poultry and Fish	-.0049	.0041
	Miscellaneous	-.0270	.0060
Intercept		.0322	.0016

(continued)

TABLE V.2.1. (Concluded)

Variable		Coefficient	Standard Error
Demand for Fruits and Vegetables			
Food at Home Expenditure		.0049	.0010
Price of:	Dairy	-.0287	.0167
	Cereal and Bakery	.0658	.0177
	Fats and Oils	-.0128	.0129
	Eggs	-.0395	.0079
	Vegetables and Fruits	.1162	.0117
	Meat, Poultry and Fish	-.0583	.0135
	Miscellaneous	-.0425	.0197
Intercept		.1592	.0053
Demand for Meat Poultry and Fish			
Food at Home Expenditure		.0650	.0016
Price of:	Dairy	-.0410	.0252
	Cereal and Bakery	-.0499	.0268
	Fats and Oils	-.0443	.0196
	Eggs	.0446	.0120
	Vegetables and Fruits	.0046	.0177
	Meat, Poultry and Fish	.1087	.0204
	Miscellaneous	-.0227	.0297
Intercept		.0730	.0080
Demand for Miscellaneous			
Food at Home Expenditure		-.0001	.0012
Price of:	Dairy	.0334	.0192
	Cereal and Bakery	-.1560	.0204
	Fats and Oils	.0705	.0149
	Eggs	.0140	.0091
	Vegetables and Fruits	-.0195	.0134
	Meat, Poultry and Fish	-.0038	.0155
	Miscellaneous	.0613	.0226
Intercept		.2076	.0061

TABLE V.2.2. SYSTEM OF EQUATIONS, SEVEN FOOD COMMODITIES

Variable	Coefficient	Standard Error
Demand for Dairy Products		
Food at Home Expenditure	-.0319	.0011
Price of: Dairy	.0570	.0136
Cereal and Bakery	.0254	.0099
Fats and Oils	.0053	.0045
Eggs	-.0003	.0037
Vegetables and Fruits	-.0193	.0085
Meat, Poultry and Fish	-.0503	.0100
Miscellaneous	-.0177	.0126
Intercept	.2775	.0048
Demand for Cereal and Bakery		
Food at Home Expenditure	-.0079	.0008
Price of: Dairy	.0254	.0099
Cereal and Bakery	.0379	.0123
Fats and Oils	.0033	.0046
Eggs	.0041	.0037
Vegetable and Fruits	-.0155	.0075
Meat, Poultry and Fish	-.0028	.0089
Miscellaneous	-.0459	.0103
Intercept	.1387	.0039
Demand for Fats and Oils		
Food at Home Expenditure	.0024	.0003
Price of: Dairy	.0053	.0045
Cereal and Bakery	-.0033	.0046
Fats and Oils	.0125	.0039
Eggs	-.0009	.0020
Vegetables and Fruits	-.0070	.0035
Meat, Poultry and Fish	-.0082	.0039
Miscellaneous	.0017	.0056
Intercept	.0144	.0016
Demand for Eggs		
Food at Home Expenditure	-.0029	.0003
Price of: Dairy	-.0003	.0037
Cereal and Bakery	.0041	.0037
Fats and Oils	-.0009	.0020
Eggs	.0161	.0022
Vegetables and Fruits	-.0110	.0030
Meat, Poultry and Fish	.0019	.0035
Miscellaneous	-.0098	.0044
Intercept	.0328	.0014

(continued)

TABLE V.2.2. (Concluded)

Variable		Coefficient	Standard Error
Demand for Vegetables and Fruits			
Food at Home Expenditure		.0042	.0010
Price of:	Dairy	-.0193	.0085
	Cereal and Bakery	-.0155	.0075
	Fats and Oils	-.0070	.0035
	Eggs	-.0110	.0030
	Vegetables and Fruits	.1004	.0108
	Meat, Poultry and Fish	-.0381	.0093
	Miscellaneous	-.0092	.0106
Intercept		0.1722	0.0043
Demand for Meat Poultry and Fish			
Food at Home Expenditure		.0654	.0016
Price of:	Dairy	-.0503	.0100
	Cereal and Bakery	-.0028	.0089
	Fats and Oils	-.0082	.0039
	Eggs	.0019	.0035
	Vegetables and Fruits	-.0381	.0093
	Meat, Poultry and Fish	.1263	.0147
	Miscellaneous	-.0287	.0116
Intercept		.0601	.0063
Demand for Miscellaneous			
Food at Home Expenditure		-.0292	-
Price of:	Dairy	-.0177	-.0126
	Cereal and Bakery	-.0459	-.0103
	Fats and Oils	-.0017	-.0056
	Eggs	-.0098	-.0044
	Vegetables and Fruits	-.0092	-.0106
	Meat, Poultry and Fish	-.0287	-.0116
	Miscellaneous	.1133	-
Intercept		.3040	-

TABLE V.2.3. ESTIMATED SYSTEM OF DEMANDS INCLUDING SOCIO-ECONOMIC AND DEMOGRAPHIC SCALE, SEVEN FOOD COMMODITIES

Variable		Coefficient	Standard Error
Demand for Dairy Products			
Food at Home Expenditure		-.0479	-.0014
Price of:	Dairy	.0525	.0157
	Cereal and Bakery	.0097	.0128
	Fats and Oils	.0028	.0055
	Eggs	.0065	.0042
	Vegetables and Fruits	.0077	.0089
	Meat, Poultry and Fish	-.0592	-.0106
	Miscellaneous	-.0202	-.0149
	KN1	.0418	.0031
	KN2	.0249	.0021
	KN3	.0341	.0038
	KN4	.0173	.0049
	KM	.0113	.0029
	KTO	.0052	.0023
	KTR	.0057	.0026
	KSEF	-.0019	-.0006
	KSEP	-.0003	-.0010
	KHEF	-.0011	-.0007
	KHEP	.0020	.0014
	KL1	.0153	.0021
	KL2	.0099	.0021
	KL3	.0152	.0020
Intercept		.2584	.0063
Demand for Cereal and Bakery			
Food at Home Expenditure		-.0165	-.0010
Price of:	Dairy	.0097	.0128
	Cereal and Bakery	.0698	.0163
	Fats and Oils	-.0045	-.0057
	Eggs	-.0090	-.0044
	Vegetables and Fruits	-.0354	-.0079
	Meat, Poultry and Fish	.0119	.0097
	Miscellaneous	-.0424	-.0125
	KN1	.0091	.0022
	KN2	.0250	.0015
	KN3	.0159	.0027
	KN4	.0210	.0035
	KM	-.0000	-.0021
	KTO	.0001	.0016
	KTR	-.0049	-.0018
	KSEF	-.0007	-.0004
	KSEP	-.0001	-.0007
	KHEF	-.0014	-.0005
	KHEP	-.0000	-.0001
	KL1	.0003	.0017
	KL2	.0003	.0016
	KL3	-.0049	-.0015
Intercept		0.1447	0.0048

(continued)

TABLE V.2.3. (Continued)

Variable		Coefficient	Standard Error
Demand for Fats and Oils			
Food at Home Expenditure		.0023	.0004
Price of:	Dairy	.0028	.0055
	Cereal and Bakery	-.0045	-.0057
	Fats and Oils	.0103	.0041
	Eggs	-.0004	-.0022
	Vegetables and Fruits	-.0077	.0036
	Meat, Poultry and Fish	-.0073	-.0041
	Miscellaneous	.0069	.0066
	KN1	-.0003	-.0009
	KN2	.0012	.0006
	KN3	.0020	.0011
	KN4	.0027	.0015
	KM	-.0003	-.0009
	KTO	.0001	.0007
	KTR	-.0011	-.0008
	KSEF	-.0000	-.0002
	KSEP	.0001	.0003
	KHEF	-.0012	-.0002
	KHEP	-.0008	-.0004
	KL1	.0010	.0007
	KL2	-.0008	-.0006
	KL3	.0010	.0006
Intercept		.016322	.0020
Demand for Eggs			
Food at Home Expenditure		-.0040	-.0004
Price of:	Dairy	.0065	.0042
	Cereal and Bakery	-.0090	-.0044
	Fats and Oils	-.0004	-.0022
	Eggs	.0197	.0023
	Vegetables and Fruits	-.0054	-.0031
	Meat, Poultry and Fish	.0018	.0036
	Miscellaneous	-.0131	-.0050
	KN1	.0015	.0009
	KN2	.0029	.0006
	KN3	.0040	.0011
	KN4	.0011	.0014
	KM	.0003	.0008
	KTO	.0014	.0006
	KTR	-.0000	-.0007
	KSEF	-.0003	-.0001
	KSEP	-.0006	-.0003
	KHEF	-.0012	-.0002
	KHEP	.0001	.0004
	KL1	.0045	.0006
	KL2	.0006	.0006
	KL3	.0015	.0006
Intercept		.0340	.0018

(continued)

TABLE V.2.3. (Continued)

Variable		Coefficient	Standard Error
Demand for Fruits and Vegetables			
Food at Home Expenditure		.0153	.0013
Price of:	Dairy	.0077	.0089
	Cereal and Bakery	-.0354	-.0079
	Fats and Oils	-.0077	-.0036
	Eggs	-.0054	-.0031
	Vegetables and Fruits	.1388	.0113
	Meat, Poultry and Fish	-.0446	-.0094
	Miscellaneous	-.0533	-.0116
	KN1	-.0115	-.0029
	KN2	-.0174	-.0020
	KN3	-.0251	-.0035
	KN4	-.0079	-.0046
	KM	-.0077	-.0028
	KTO	.0020	.0021
	KTR	.0033	.0024
	KSEF	.0008	.0006
	KSEP	.0013	.0009
	KHEF	.0013	.0007
	KHEP	.0027	.0013
	KL1	.0155	.0020
	KL2	.0079	-.0019
	KL3	-.0051	.0019
Intercept		.15894	.0057
Demand for Meat, Poultry and Fish			
Food at Home Expenditure		.0844	.0019
Price of:	Dairy	-.0592	-.0106
	Cereal and Bakery	.0119	.0097
	Fats and Oils	-.0073	-.0041
	Eggs	.0018	.0036
	Vegetables and Fruits	-.0446	-.0094
	Meat, Poultry and Fish	.1225	.0148
	Miscellaneous	-.0249	-.0123
	KN1	-.0597	-.0043
	KN2	-.0498	-.0030
	KN3	-.0318	-.0053
	KN4	-.0370	-.0069
	KM	-.0021	-.0041
	KTO	-.0048	-.0032
	KTR	-.0042	-.0036
	KSEF	.0028	.0009
	KSEP	-.0000	-.0014
	KHEF	.0000	.0011
	KHEP	-.0030	-.0019
	KL1	-.0229	-.0028
	KL2	-.0103	-.0027
	KL3	-.0130	-.0027
Intercept		.0784	.0085

(continued)

TABLE V.2.3. (Concluded)

Variable		Coefficient	Standard Error
Demand for Miscellaneous			
Food at Home Expenditure		-.0336	-0.0021
Price of:	Dairy	-.0202	-.0149
	Cereal and Bakery	-.0424	-.0125
	Fats and Oils	-.0069	-.0066
	Eggs	-.0131	-.0050
	Vegetables and Fruits	-.0533	-.0116
	Meat, Poultry and Fish	-.0124	-.0123
	Miscellaneous		
	KN1	.0190	-0.0046
	KN2	.0130	-0.0031
	KN3	.0008	-0.0056
	KN4	.0027	-0.0073
	KM	-.0014	-0.0044
	KTO	-.0042	-0.0034
	KTR	.0012	-0.0038
	KSEF	-.0006	-0.0010
	KSEP	-.0002	-0.0015
	KHEF	.0036	-0.0008
	KHEP	-.0009	-0.0021
	KL1	-.0138	-0.0032
	KL2	-.0075	-0.0030
	KL3	.0053	-0.0031
Intercept		.3091	-0.0243

Family Size: KN1 = under 5 years
KN2 = 5 - 15 years
KN3 = 16 - 64 years
KN4 = over 65 years

Marital Status: KM = married

Class of Tenure: KTO = Homeowners with mortgage
KTR = Tenants regular

Employment Status: KSEF = Full-time Employment of Spouse
KSEP = Part-time Employments of Spouse
KHEF = Full-time Employment of Household Head
KHEP = Part-time Employment of Household Head

City: KL1 = Toronto, Winnipeg, Edmonton, Vancouver
KL2 = Montreal, Ottawa, Edmonton, Vancouver
KL3 = Halifax, Ottawa, Winnipeg, Vancouver

TABLE V.3. MATRICES OF UNCOMPENSATED ELASTICITIES OF DEMAND: SEVEN FOODS

	Expenditure		With respect to price of						
	Food at home	Total	Dairy	Cereal and bakery	Fats and oils	Eggs	Vegetables and fruits	Meat, poultry and fish	Miscellaneous
I Single equations									
Quantity demanded of:									
Dairy products	.7847	.1394	-.8964	.7099	- .1393	-.0867	- .2567	- .2606	.1460
Cereal and bakery	.9282	.1649	.1075	-.6691	.1721	-.0544	- .3307	.0957	- .2507
Fats and oils	1.1019	.1958	.8066	-.7709	- .1923	-.1793	- .3158	- .0953	- .3620
Eggs	.8721	.1550	.1460	.5076	.2867	-.4236	- .4443	- .1748	-1.1708
Vegetables and fruits	1.0281	.1827	-.1690	.3740	-0.7482	-.2280	- .3430	- .3448	- .2499
Meat, poultry & fish	1.1920	.2118	-.1478	-.1694	- .1370	.1279	- .0208	- .7503	- .1067
Miscellaneous	.9992	.1776	.1867	-.8663	.3928	.0781	- .1084	-0.2140	- .6639
II System of equations									
Quantity demanded of:									
Dairy products	.7829	.1391	-.5871	.1979	.0429	.0026	- .0932	- .2662	- .0772
Cereal and bakery	.9286	.1650	.2389	-.6547	- .0280	.0390	- .1267	.0002	- .3982
Fats & oils	1.1013	.1950	.2132	-.1521	- .4787	-.0416	- .3181	- .3858	.0527
Eggs	.8691	.1544	.0006	.1978	- .0372	-.2876	- .4645	.1313	- .4108
Vegetables and fruits	1.0244	.1820	-.1147	-.0916	- .0414	-.0638	- .4336	- .2274	- .0583
Meat, poultry and fish	1.1932	.2120	-.1755	-.0298	- .0301	.0009	- .1482	- .6985	- .1247
Miscellaneous	.8381	.1489	-.0773	-.2368	.0143	-.0510	- .0224	- .1022	- .3610
III System of equations with socio-economic and demographic scale									
Quantity demanded of:									
Dairy products	.6739	.1197	-.6020	.1020	.0290	.0524	.1123	- .2880	- .0710
Cereal and bakery	.8522	.1514	.1075	-.3590	- .0369	-.0778	- .2920	.1590	- .3516
Fats and oils	1.0985	.1952	.1087	-.2039	- .5709	-.0229	- .3451	- .3467	.2733
Eggs	.8223	.1461	.3120	-.3804	- .0164	-.1257	- .2100	.1455	- .5450
Vegetables and fruits	1.0879	.1933	.0329	-.2129	- .0469	-.0335	- .2241	- .2870	- .3240
Meat, poultry and fish	1.2493	.2220	-.2096	.0070	- .0290	.0005	- .1770	- .7000	- .1200
Miscellaneous	.8130	.1446	-.0870	-.2100	.0440	-.0685	- .2632	- .0720	- .1484

- continued -

TABLE V.3. MATRICES OF UNCOMPENSATED ELASTICITIES OF DEMAND: SEVEN FOODS (concluded)

	With respect to: Number of Household Members				Presence of married couple	Employment of Female Head	
	aged 5 years	aged 5 to 15 years	aged 16 to 64 years	aged 64 years		full-time	part-time
Quantity demanded of:							
Dairy products	.0548	.0640	.1539	.0206	.0539	-.0120	-.0018
Cereal and bakery	.0157	.0848	.0942	.0331	-.0001	-.0059	-.0012
Fats and oils	-.0027	.0193	.0563	.0204	-.0096	-.0025	.0051
Eggs	.0135	.0496	.1190	.0089	.0098	-.0151	-.0207
Vegetables and fruits	-.0127	-.0376	-.0952	-.0080	-.0309	.0045	.0058
Meat, poultry and fish	-.0339	-.0556	-.0622	-.0192	-.0044	.0076	-.0002
Miscellaneous	.0203	.0273	.0029	.0026	.0054	-.0030	-.0010

	Employment of Male Head		Homeownership without mortgage	Homeownership with mortgage	Renting (regular tenancy)
	full-time	part-time			
Quantity demanded of:					
Dairy products	-.0074	.0080	0.0495	.0190	.0305
Cereal and bakery	-.0126	-.0002	-0.0332	.0008	-.0341
Fats and oils	-.0504	-.0202	-0.0344	.0026	-.0370
Eggs	-.0556	.0046	0.0320	.0340	-.0020
Vegetables and fruits	.0076	.0090	0.0211	.0061	.0149
Meat, poultry and fish	.0002	-.0052	-0.0173	-.0075	-.0098
Miscellaneous	.0195	-.0031	-0.0072	-.0125	.0053

	With respect to: Urban location						
	Halifax	Montreal	Ottawa	Toronto	Winnipeg	Edmonton	Vancouver
Quantity demanded of:							
Dairy products	.0576	.0358	.0934	.0443	.1019	.0801	.1377
Cereal and bakery	.0017	.0015	.0032	-.0189	-.0172	-.0174	-.0157
Fats and oils	.0251	-.0190	.0060	.0181	.0433	-.0008	.0242
Eggs	.1097	.0157	.1254	.0300	.1397	.0457	.1554
Vegetables and fruits	.0490	.0240	.0730	-.0126	.0363	.0114	.0604
Meat, poultry and fish	-.0374	-.0163	-.0539	-.0164	.0539	-.0328	-.0702
Miscellaneous	-.0422	-.0222	-.0645	.0125	-.0296	-.0096	-.0519

TABLE V.4. MATRICES OF COMPENSATED ELASTICITIES OF DEMAND

	With respect to the price of						
	Dairy	Cereal and bakery	Fats and oils	Eggs	Vegetables and fruits	Meat, poultry and fish	Miscel-laneous
I Single Equations							
Quantity demanded of:							
Dairy products	-.7810	.7976	-.1206	-.0689	-.1193	.0052	.2878
Cereal and bakery	.2441	-.5653	.1942	-.0333	-.1682	.4102	- .0829
Fats and oils	.9687	-.6477	-.1661	-.1542	-.1229	.2779	- .1629
Eggs	.2743	.6051	.3075	-.4038	.1082	.1206	-1.1013
Vegetables and fruits	-.0177	.4890	-.0503	-.2047	-.1630	.0034	- .0641
Meat, poultry and fish	.0275	-.0361	-.1087	.1550	.1878	-.3465	.1086
Miscellaneous	.3337	-.7545	.4166	.1008	.0664	.3171	- .4834
II System of equations							
Quantity demanded of							
Dairy products	-.4719	.2854	.0615	.0204	.0437	-.0009	.1641
Cereal and bakery	.3755	-.5509	-.0059	.0601	.0358	.3148	- .2304
Fats and oils	.3753	-.0281	-.4525	-.0166	-.1253	-.0126	.2517
Eggs	.1285	.2950	-.0165	-.2679	-.3123	.4257	- .2538
Vegetables and fruits	.0360	.0228	-.0170	-.0406	-.2542	.1196	.1267
Meat, poultry and fish	.0000	.1035	-.0017	.0280	.0606	-.2942	.0907
Miscellaneous	.0459	-.1430	.0342	-.0320	.1243	.1817	- .2095
III System of equations including Socio-economic and demographic scale							
Quantity demanded of:							
Dairy	-.5037	.1700	.0451	.0677	.2303	-.0000	.0490
Cereal and bakery	.2329	-.2640	-.0166	-.0584	-.1400	.4480	- .1976
Fats and oils	.2704	-.0811	-.5440	.0020	-.1528	.0250	.4710
Eggs	.4330	-.2880	.0031	-.1070	-.0662	.4241	- .3968
Vegetables and fruits	.1930	-.0912	-.0211	-.0088	-.0336	.0808	- .1276
Meat, poultry and fish	-.0250	.1470	.0006	.0278	.0408	-.3060	.1007
Miscellaneous	.0319	-.1241	.0633	-.0500	-.1207	.2030	- .0014

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